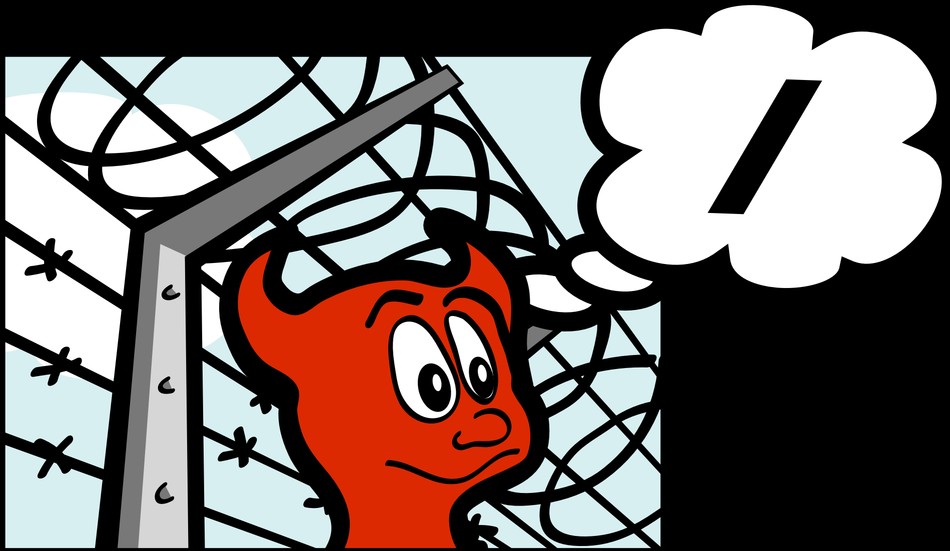


jail(8)

Hacking UNIX with FreeBSD jail(8), Secure Virtual Servers

Presentation for DefCon 14, by Isaac Levy, (.ike)

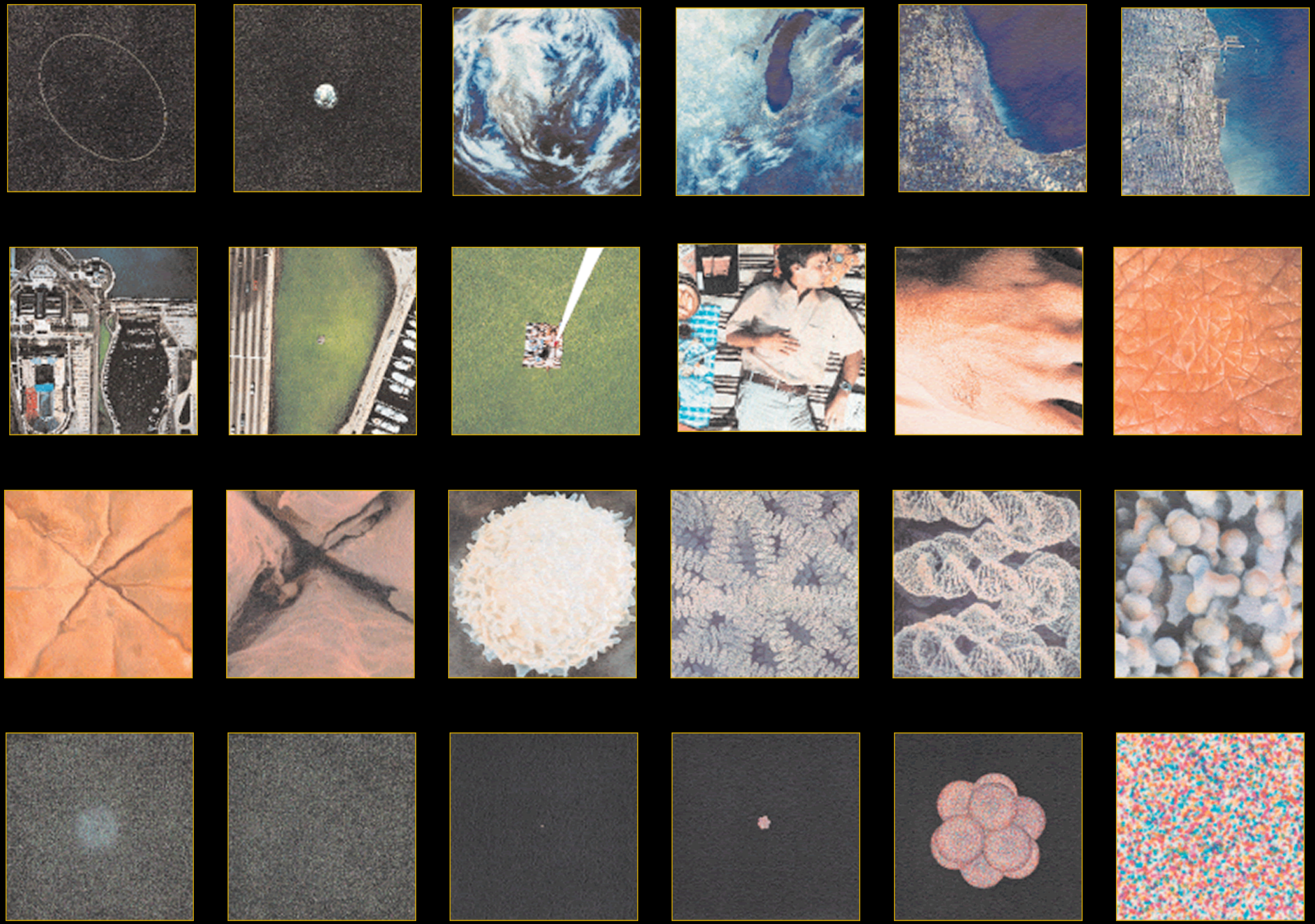
.ike Context

- I have used jails extensively for web application servers and software development purposes
- the methodology I’m presenting here is attempting to be ‘stock’ UNIX (no ‘ike-specific’ magic formulas)
- I am not a jail author, no commit bit...

Warranty / Announcement

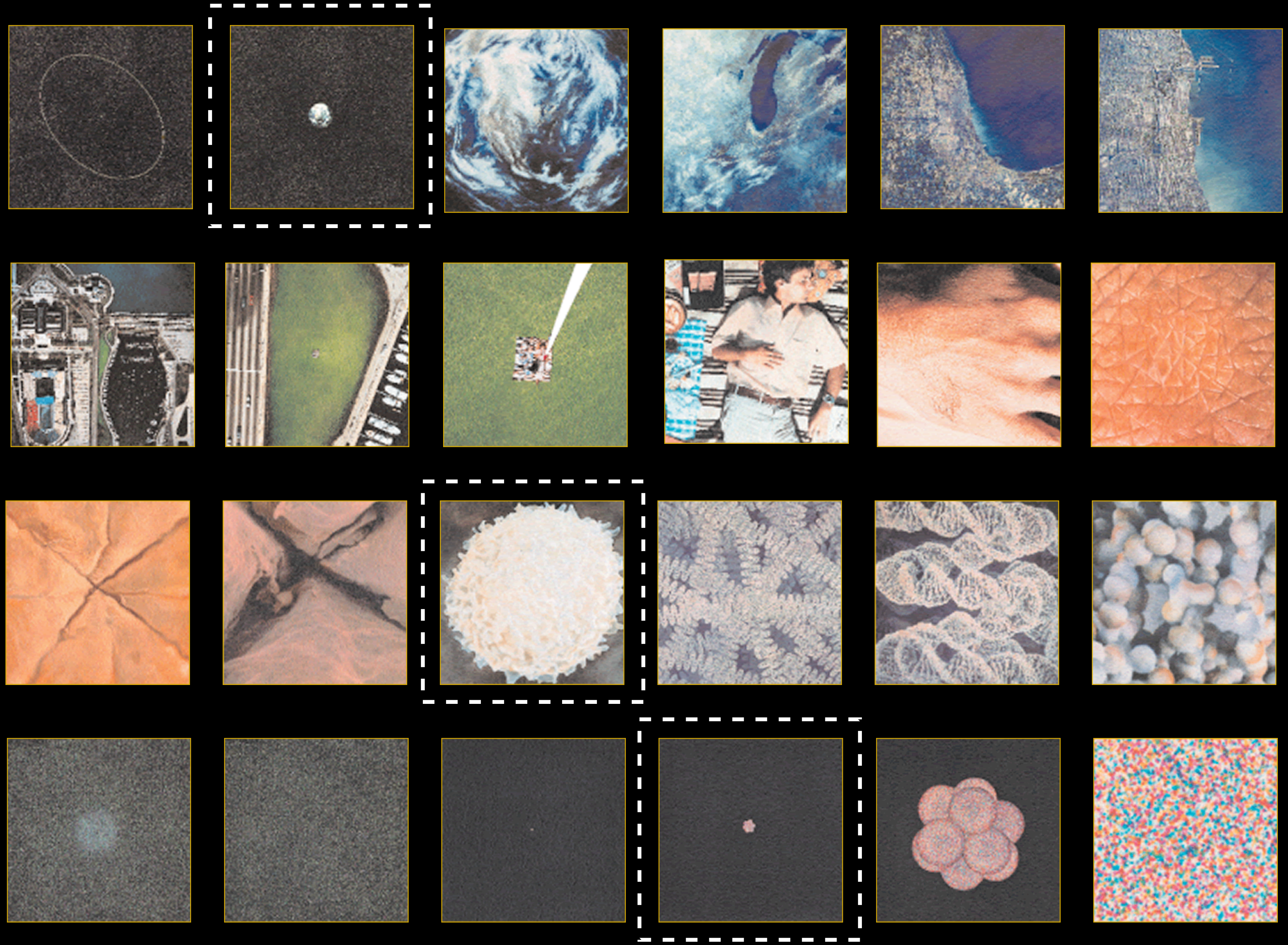
- I’ll be out and about later if anyone has more complex questions or strategies they want to discuss
- I’m *trying* to stick to classic UNIX process and ideas, and ‘stock’ methodology (no ike-specific magic)
- I’m assuming you all know your way around various *NIX Operating Systems

scale, patterns, complexity
(a big picture exercise)



Film: Powers of Ten, 1977, Charles and Ray Eames

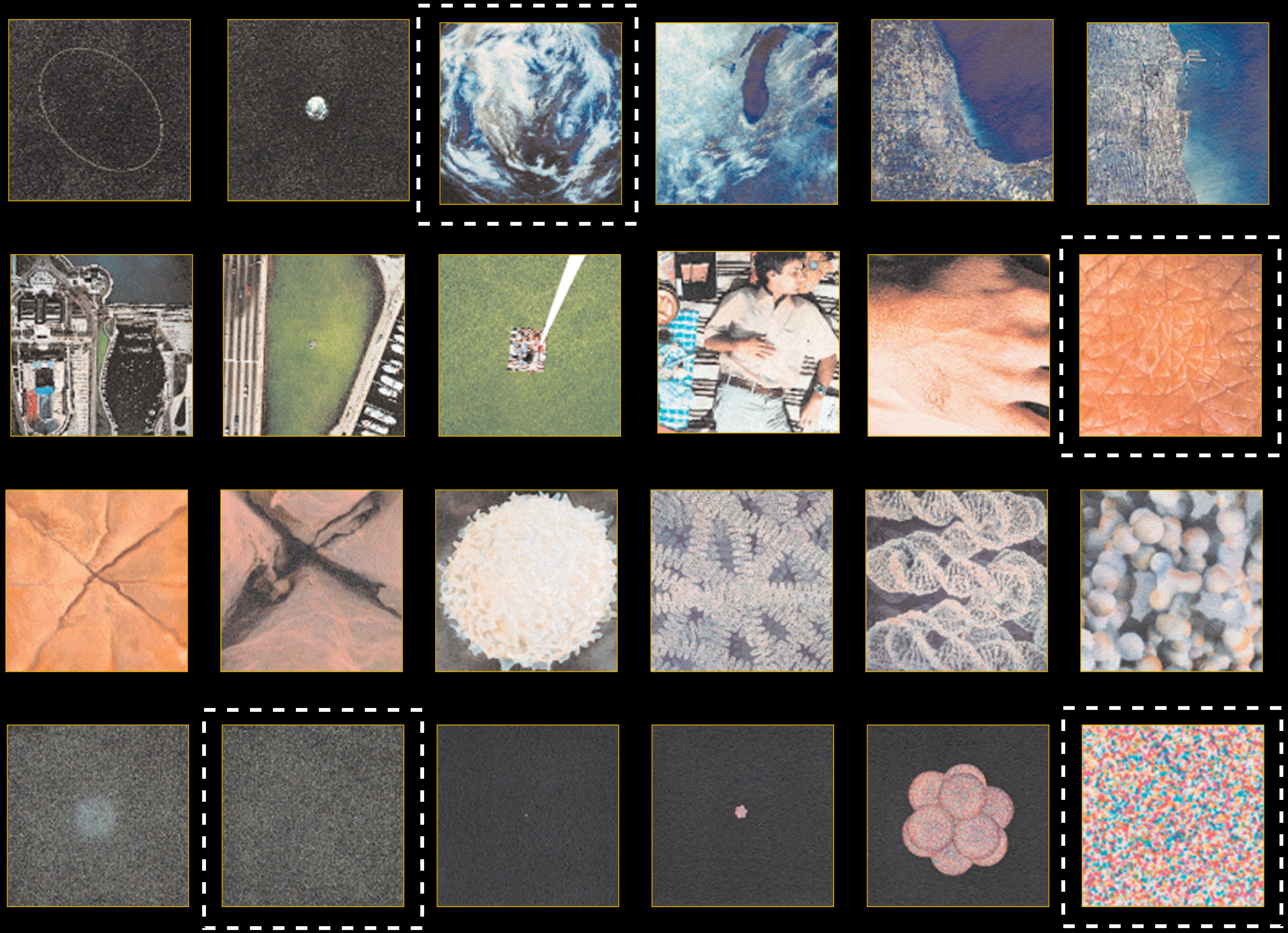
http://www.powersof10.com/
http://www.youtube.com/watch?v=4i6B7HzijSo



Film: Powers of Ten, 1977, Charles and Ray Eames

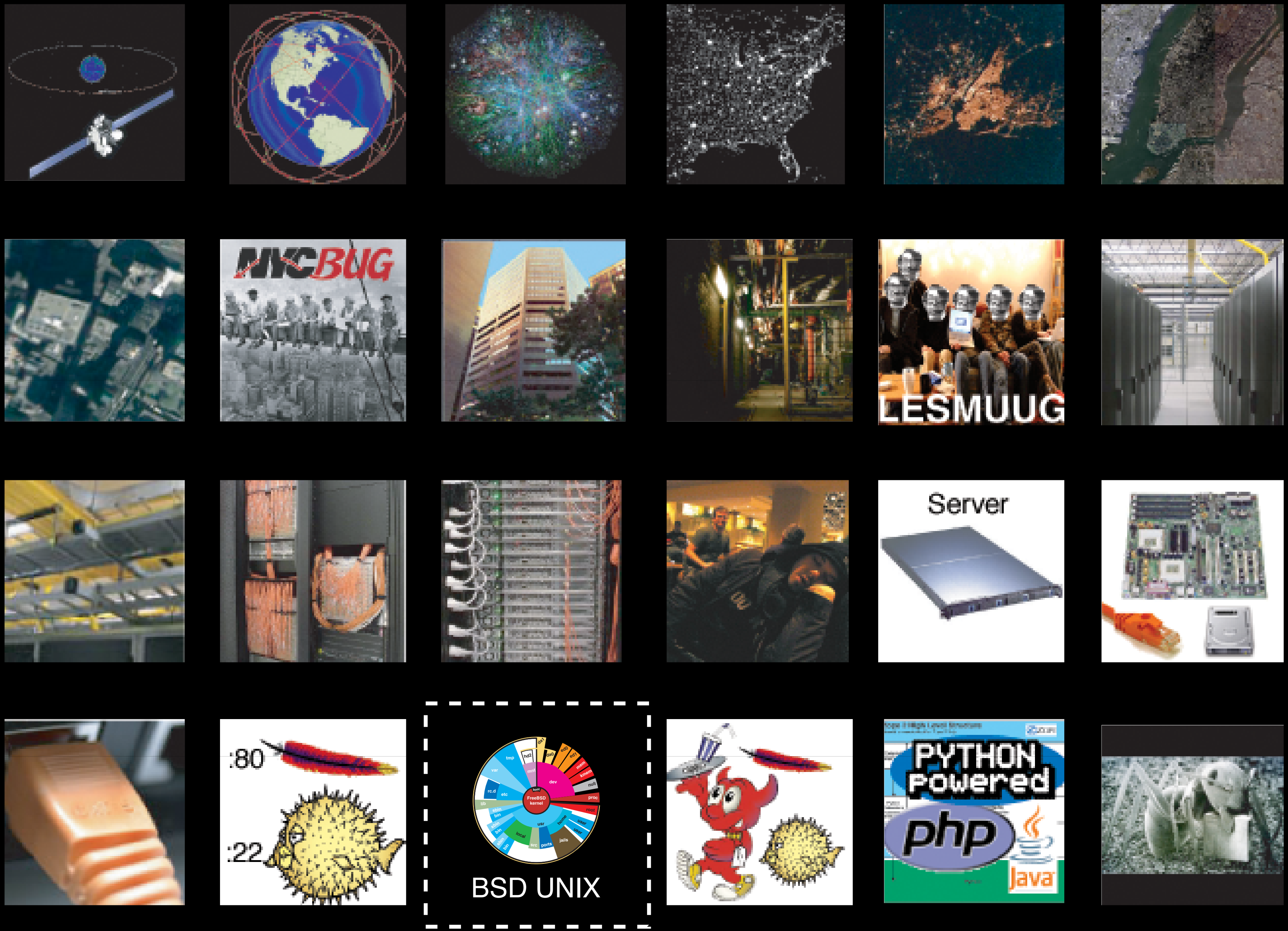
http://www.powersof10.com/

http://www.youtube.com/watch?v=4i6B7HzijSo

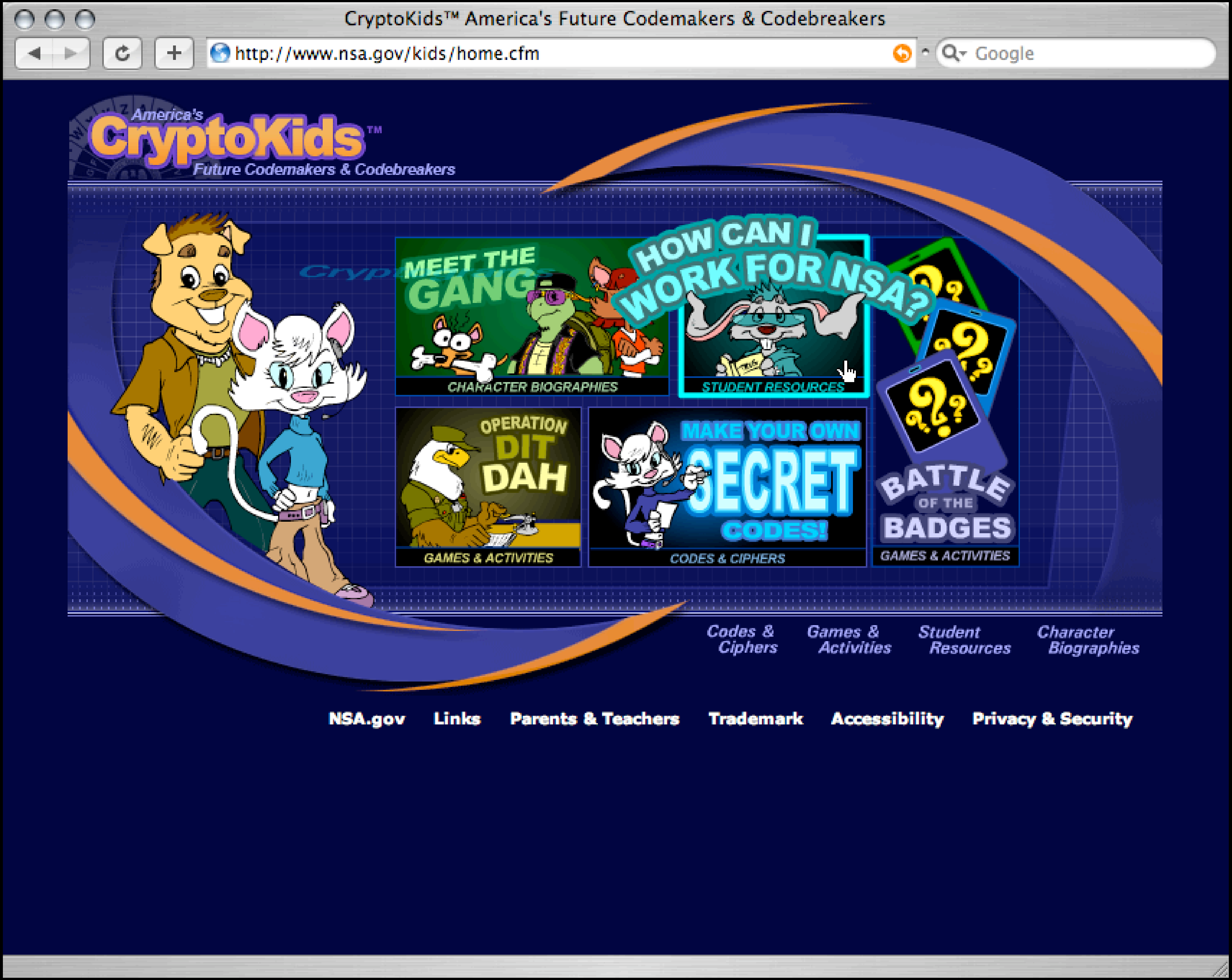


Film: Powers of Ten, 1977, Charles and Ray Eames

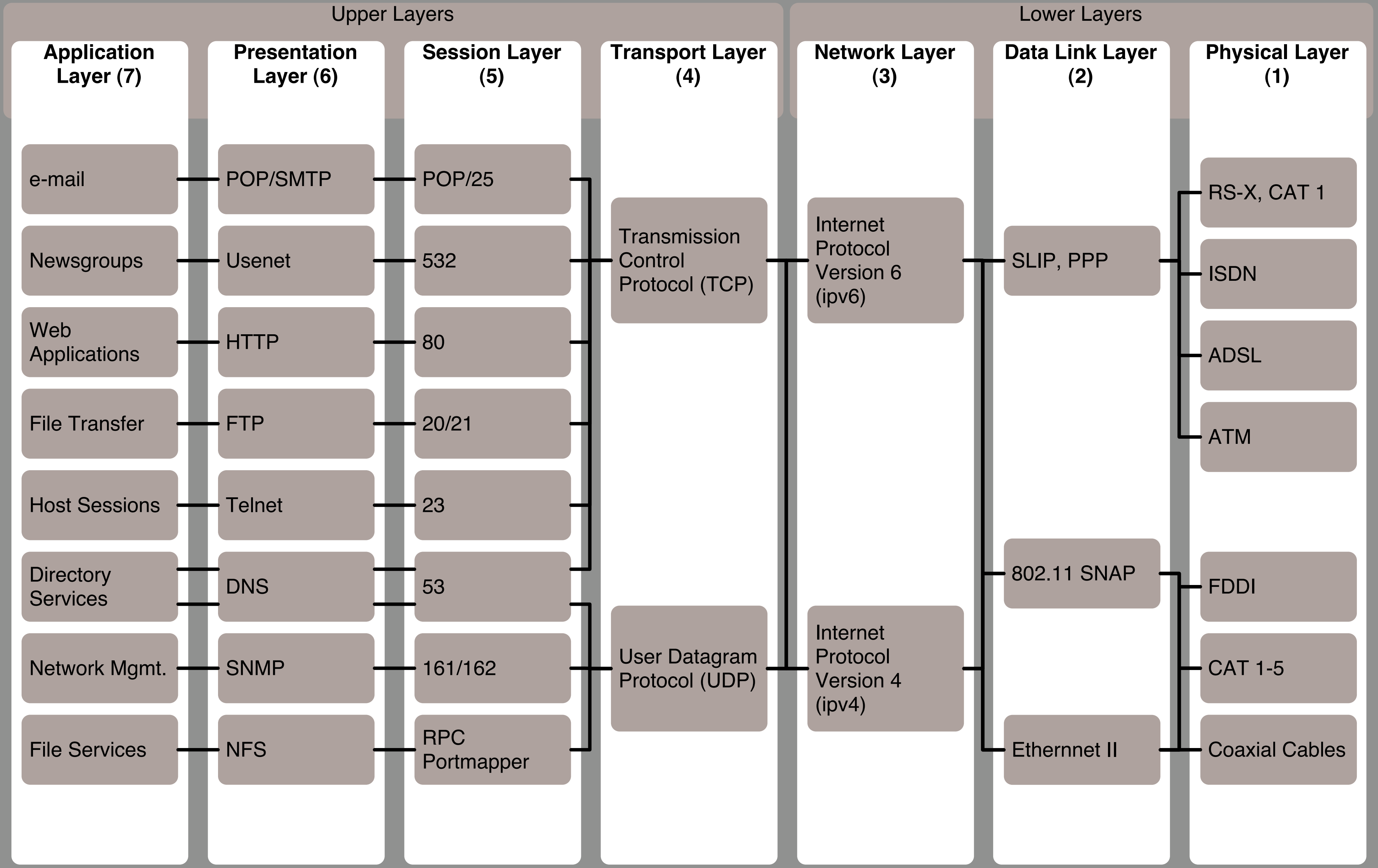
http://www.powersof10.com/
http://www.youtube.com/watch?v=4i6B7HzijSo



Internet universe, (according to ike, today.)


CryptoKids™ America's Future Codemakers & Codebreakers
http://www.nsa.gov/kids/home.cfm
Google
America's
CryptoKids™
Future Codemakers & Codebreakers
MEET THE GANG
CHARACTER BIOGRAPHIES
HOW CAN I WORK FOR NSA?
STUDENT RESOURCES
OPERATION DIT DAH
GAMES & ACTIVITIES
MAKE YOUR OWN SECRET CODES!
CODES & CIPHERS
BATTLE OF THE BADGES
GAMES & ACTIVITIES
Codes & Ciphers
Games & Activities
Student Resources
Character Biographies
NSA.gov
Links
Parents & Teachers
Trademark
Accessibility
Privacy & Security

Open Systems Interconnection (OSI) Reference Model



Upper Layers

Lower Layers

Application Layer (7)
- e-mail
- Newsgroups
- Web Applications
- File Transfer
- Host Sessions
- Directory Services
- Network Mgmt.
- File Services

Presentation Layer (6)
- POP/SMTP
- Usenet
- HTTP
- FTP
- Telnet
- DNS
- SNMP
- NFS

Session Layer (5)
- POP/25
- 532
- 80
- 20/21
- 23
- 53
- 161/162
- RPC Portmapper

Transport Layer (4)
- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

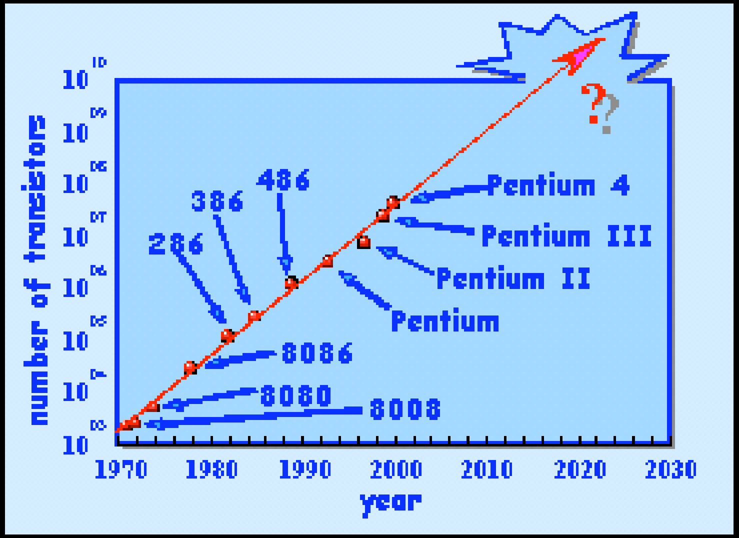
Network Layer (3)
- Internet Protocol Version 6 (ipv6)
- Internet Protocol Version 4 (ipv4)

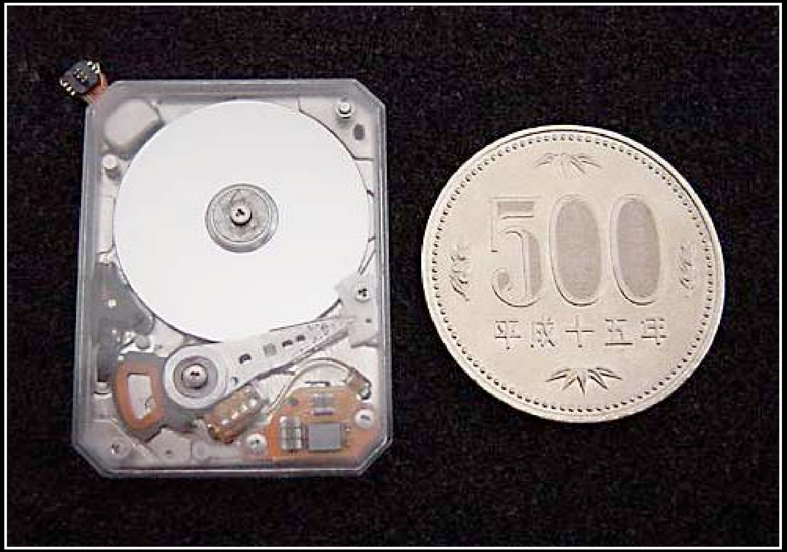
Data Link Layer (2)
- SLIP, PPP
- 802.11 SNAP
- Ethernnet II

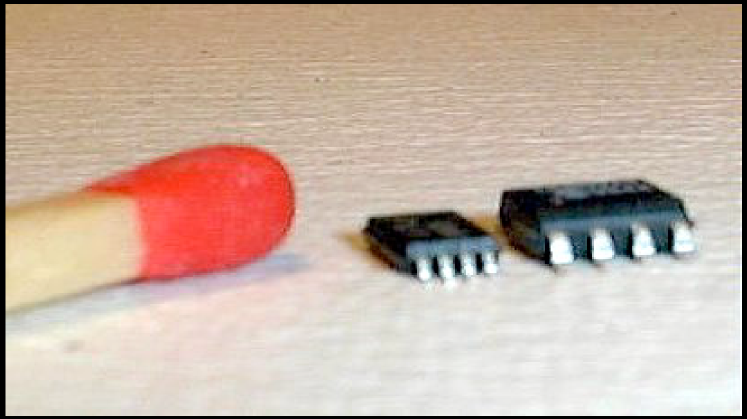
Physical Layer (1)
- RS-X, CAT 1
- ISDN
- ADSL
- ATM
- FDDI
- CAT 1-5
- Coaxial Cables

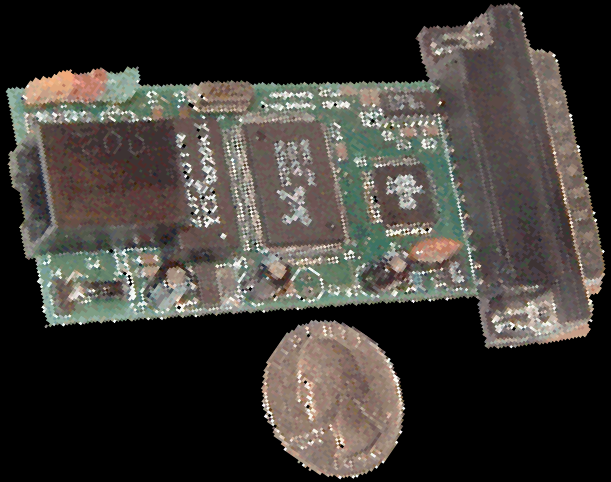
Internet universe, (according to ike, today.)

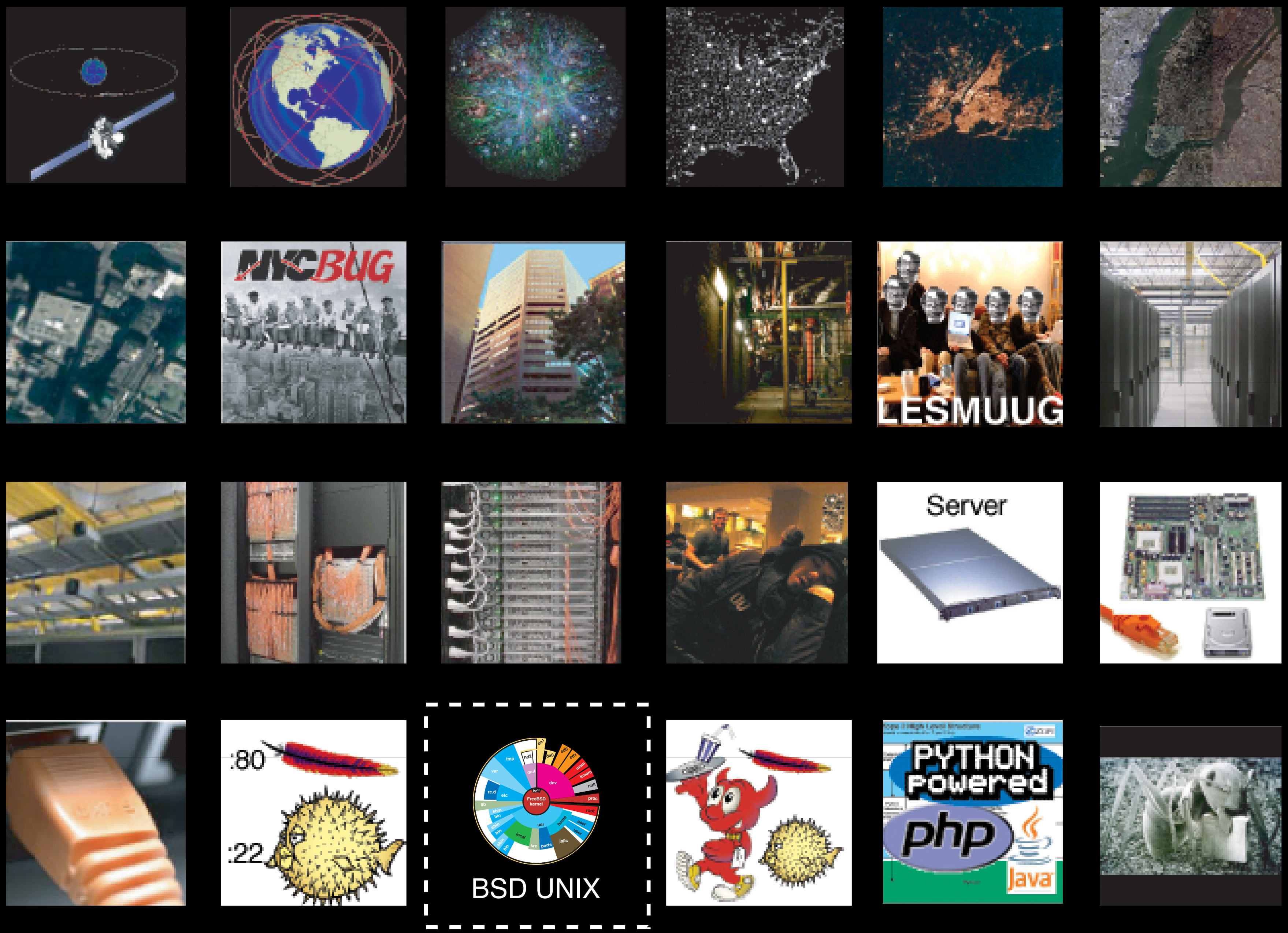
yadda yadda


number of transistors
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
?
486
386
286
Pentium 4
Pentium III
Pentium II
Pentium
8086
8080
8008
1970
1980
1990
2000
2010
2020
2030
year


500
平成十五年

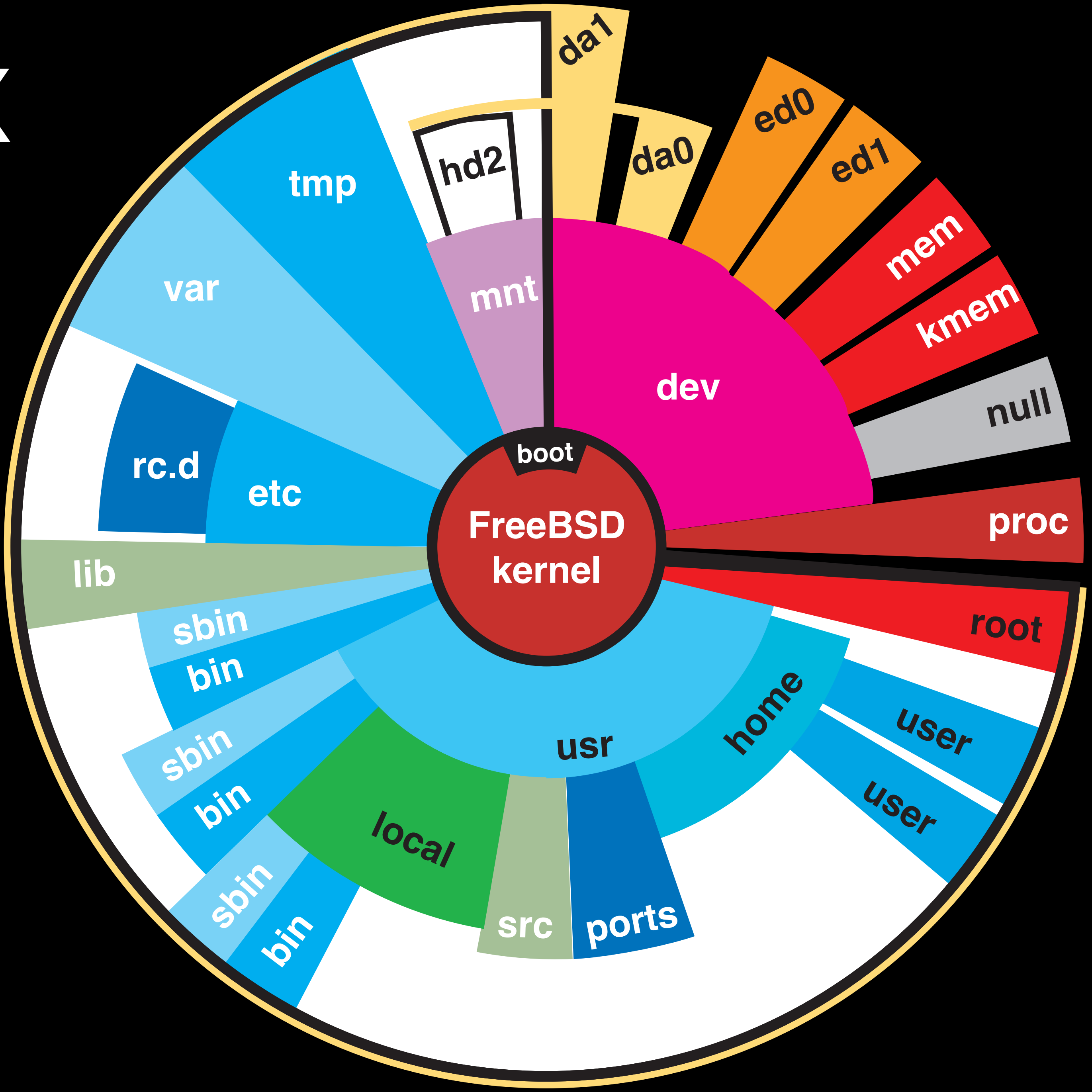




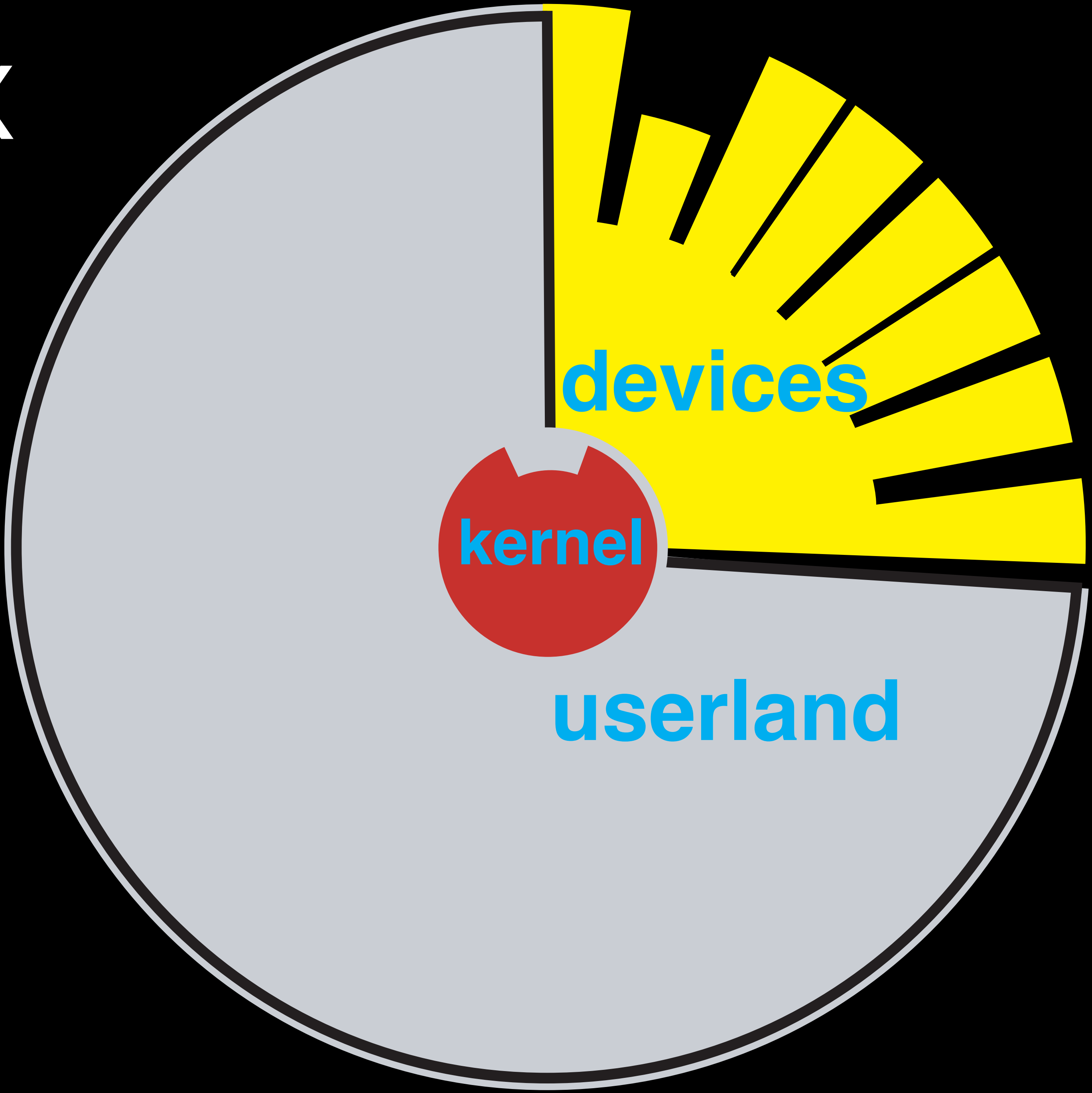


Internet universe, (according to ike, today.)

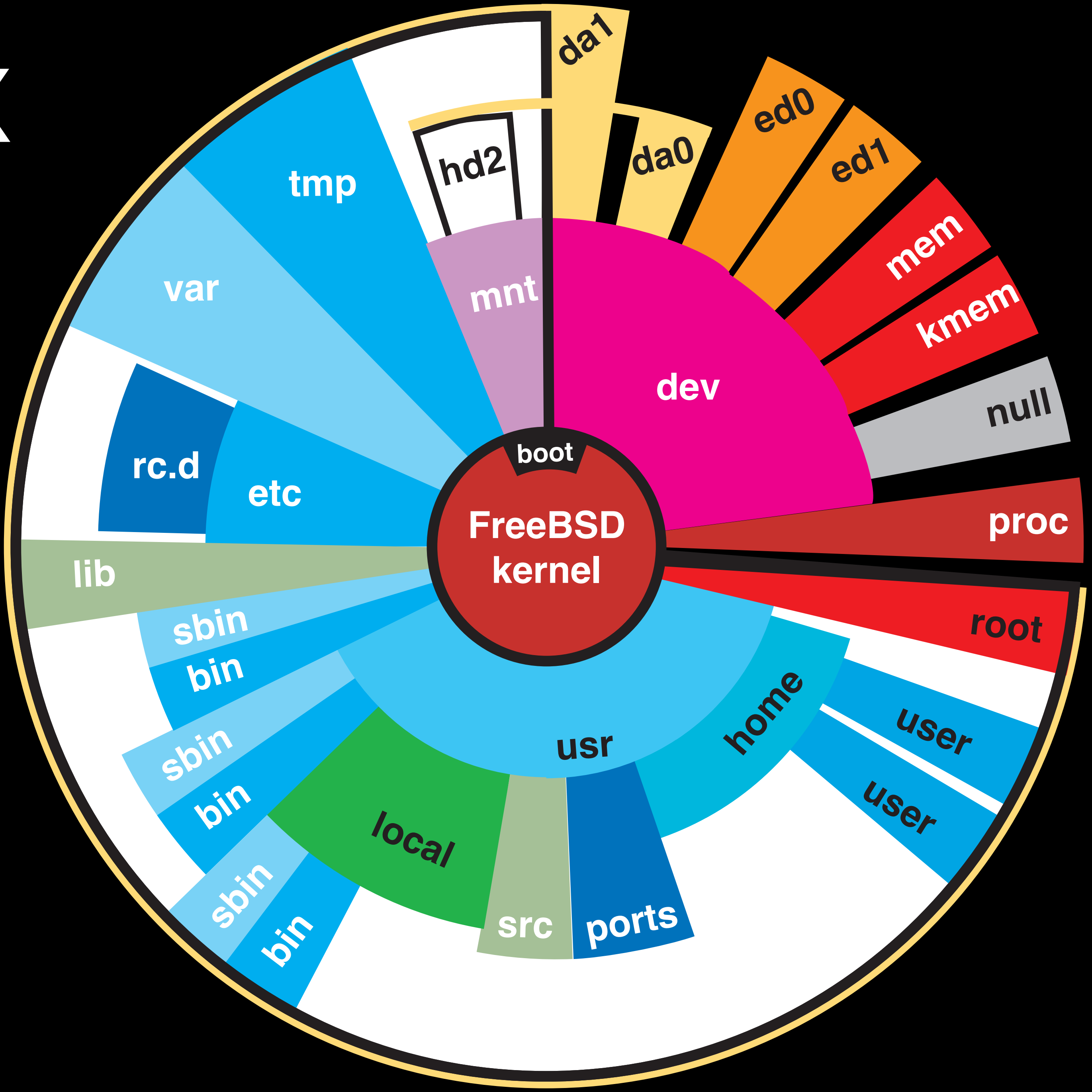
UNIX


FreeBSD kernel
boot
mnt
hd2
dev
da1
da0
ed0
ed1
mem
kmem
null
proc
root
tmp
var
etc
rc.d
lib
sbin
bin
usr
sbin
bin
local
sbin
bin
src
ports
home
user
user

UNIX



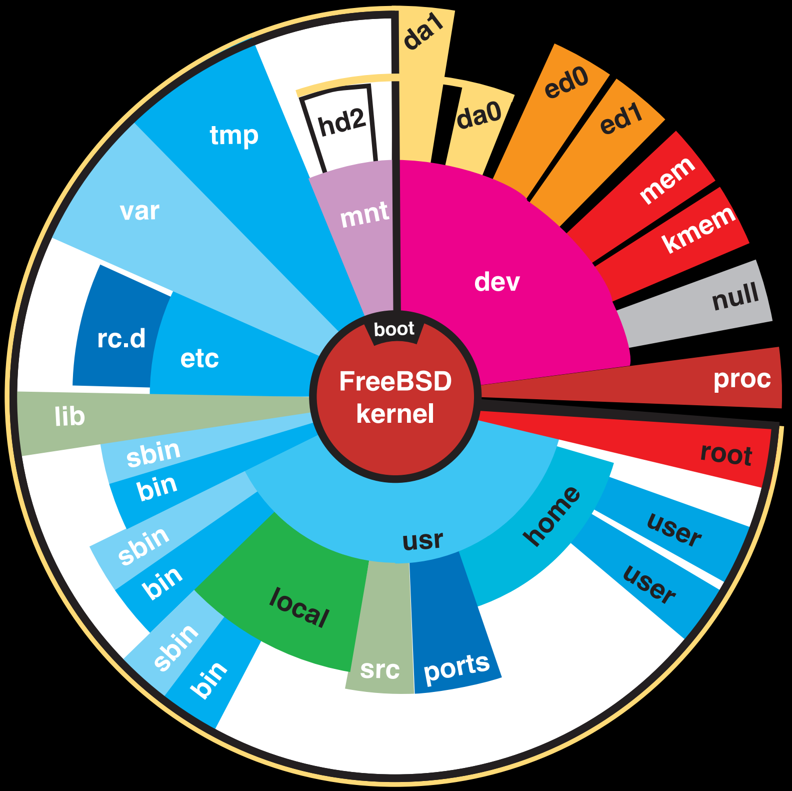
UNIX



FreeBSD kernel
boot
dev
da1
da0
ed0
ed1
mem
kmem
null
proc
root
home
user
user
usr
ports
src
local
bin
sbin
bin
sbin
bin
sbin
lib
etc
rc.d
var
tmp
mnt
hd2

UNIX

Spiral Galaxy



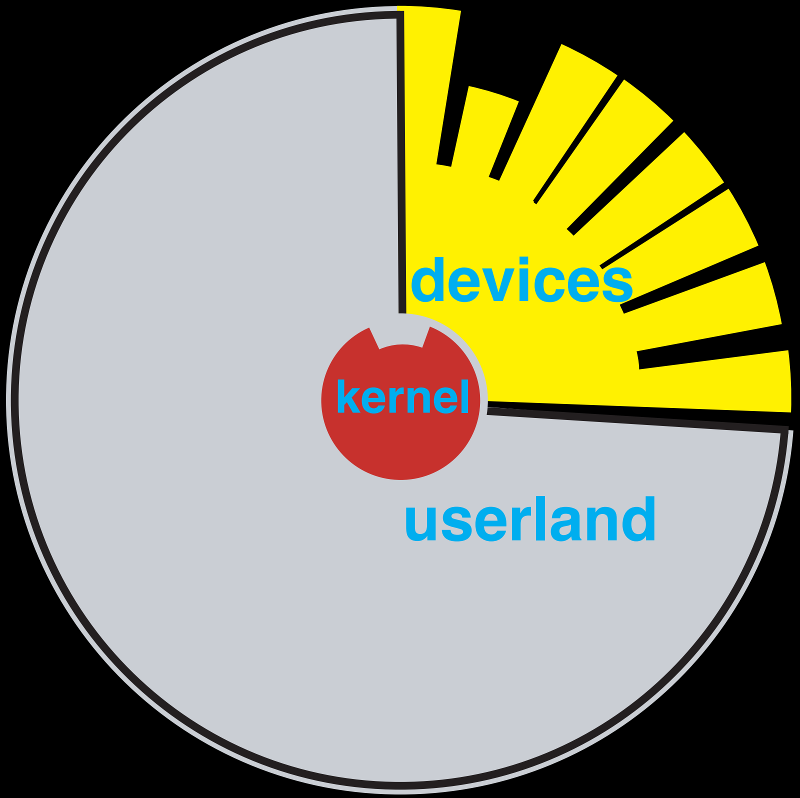
Spiral Galaxy NGC 1232

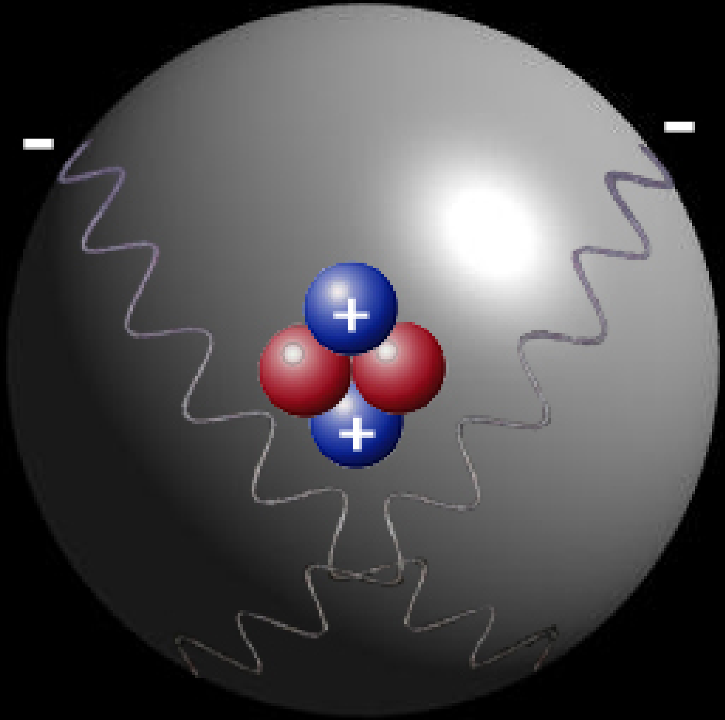
Our world is complex

(thx Dan Geer & ShmooCon).

UNIX

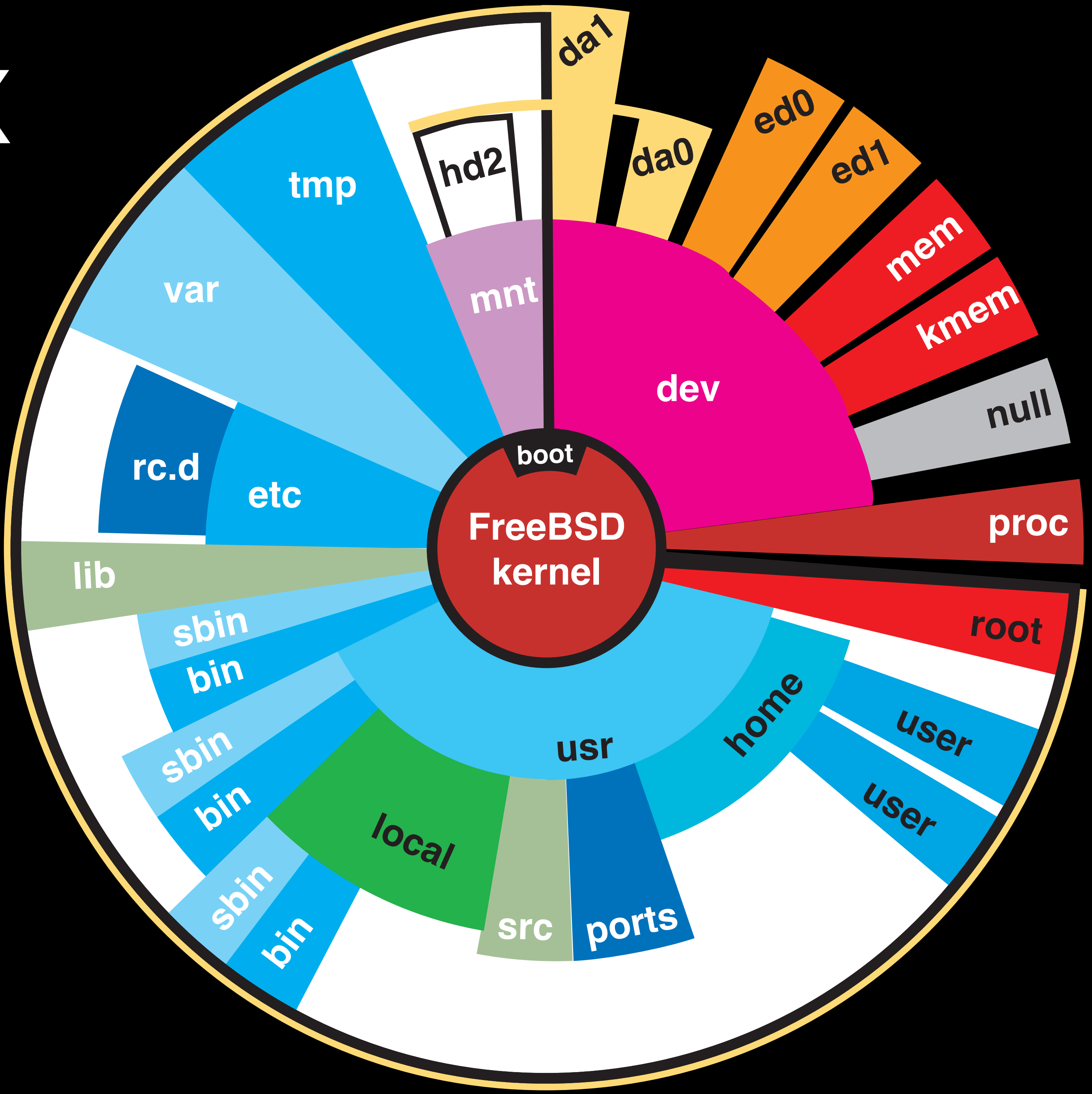
Helium Atom



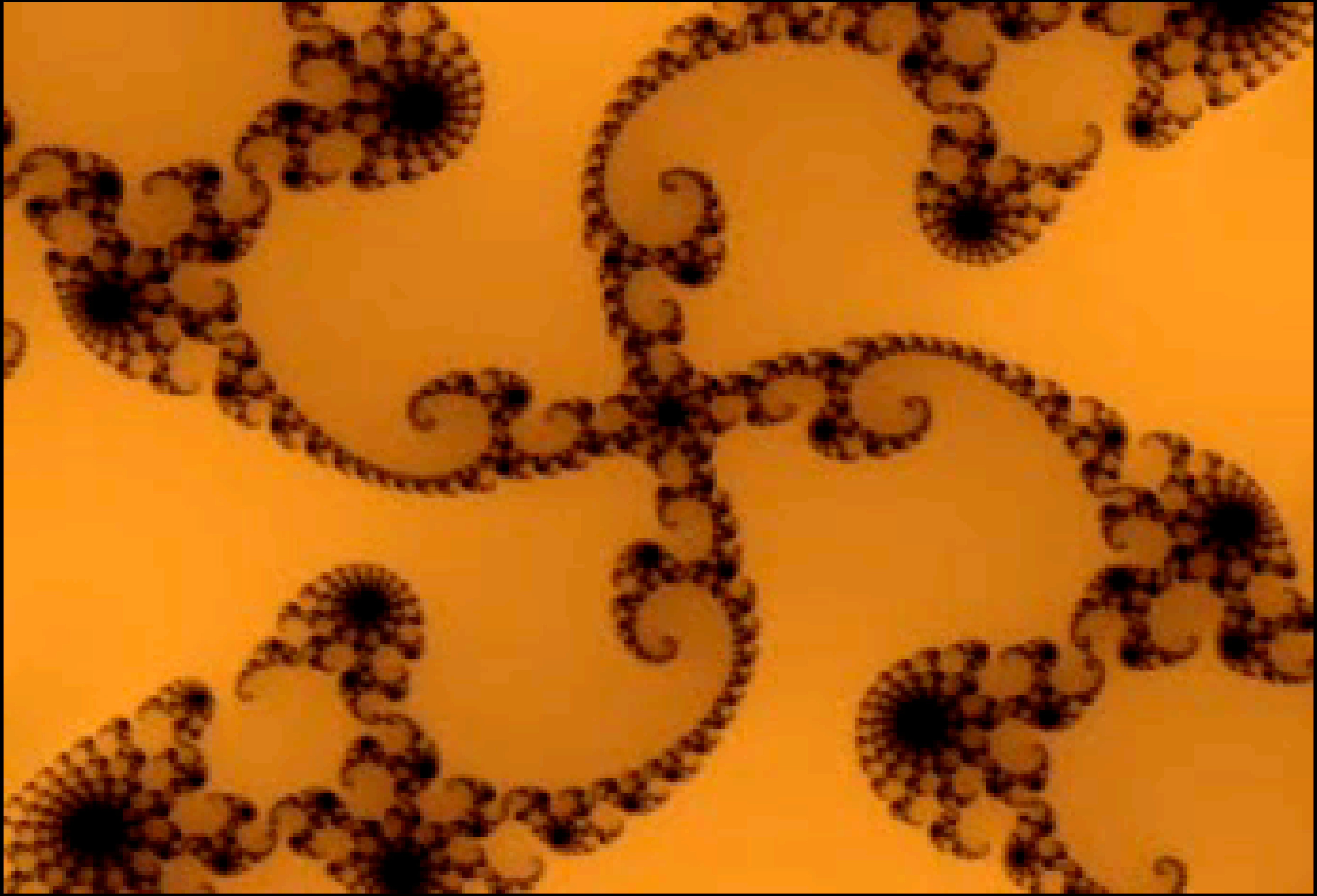


Our world is simple too...

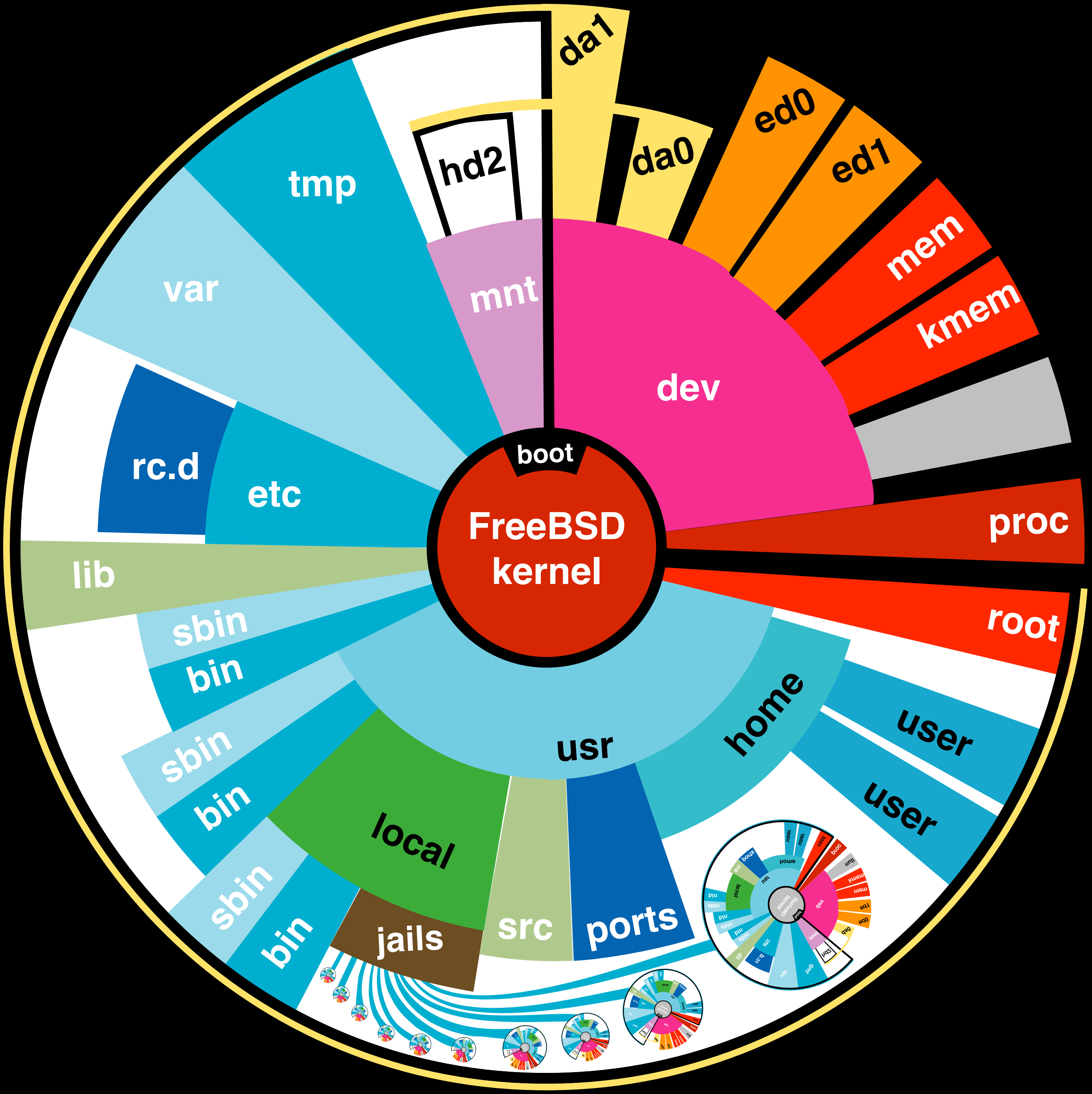
UNIX



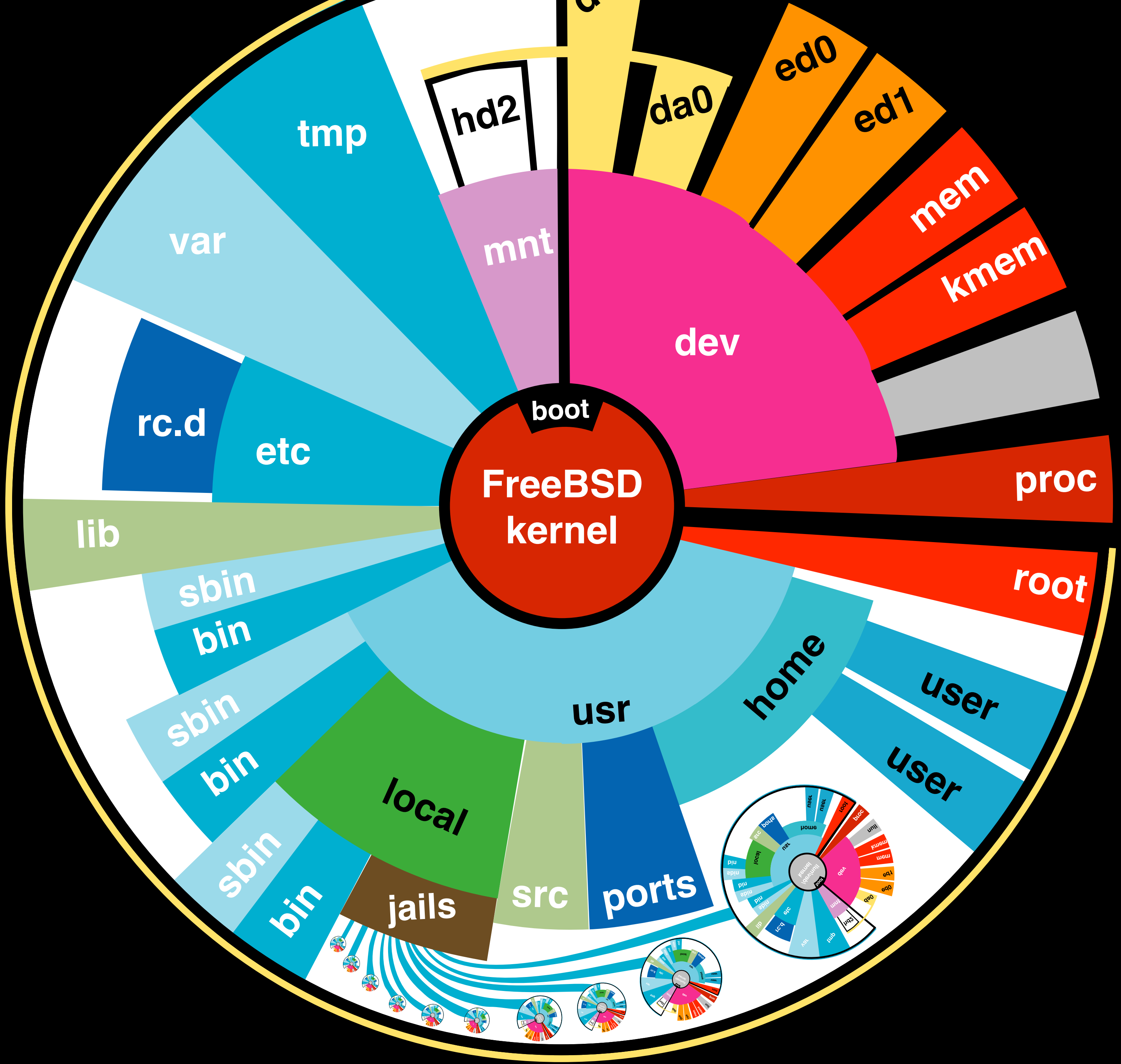
FreeBSD kernel
boot
dev
da1
da0
ed0
ed1
mem
kmem
null
proc
root
mnt
hd2
tmp
var
etc
rc.d
lib
sbin
bin
usr
sbin
bin
sbin
bin
local
src
ports
home
user
user

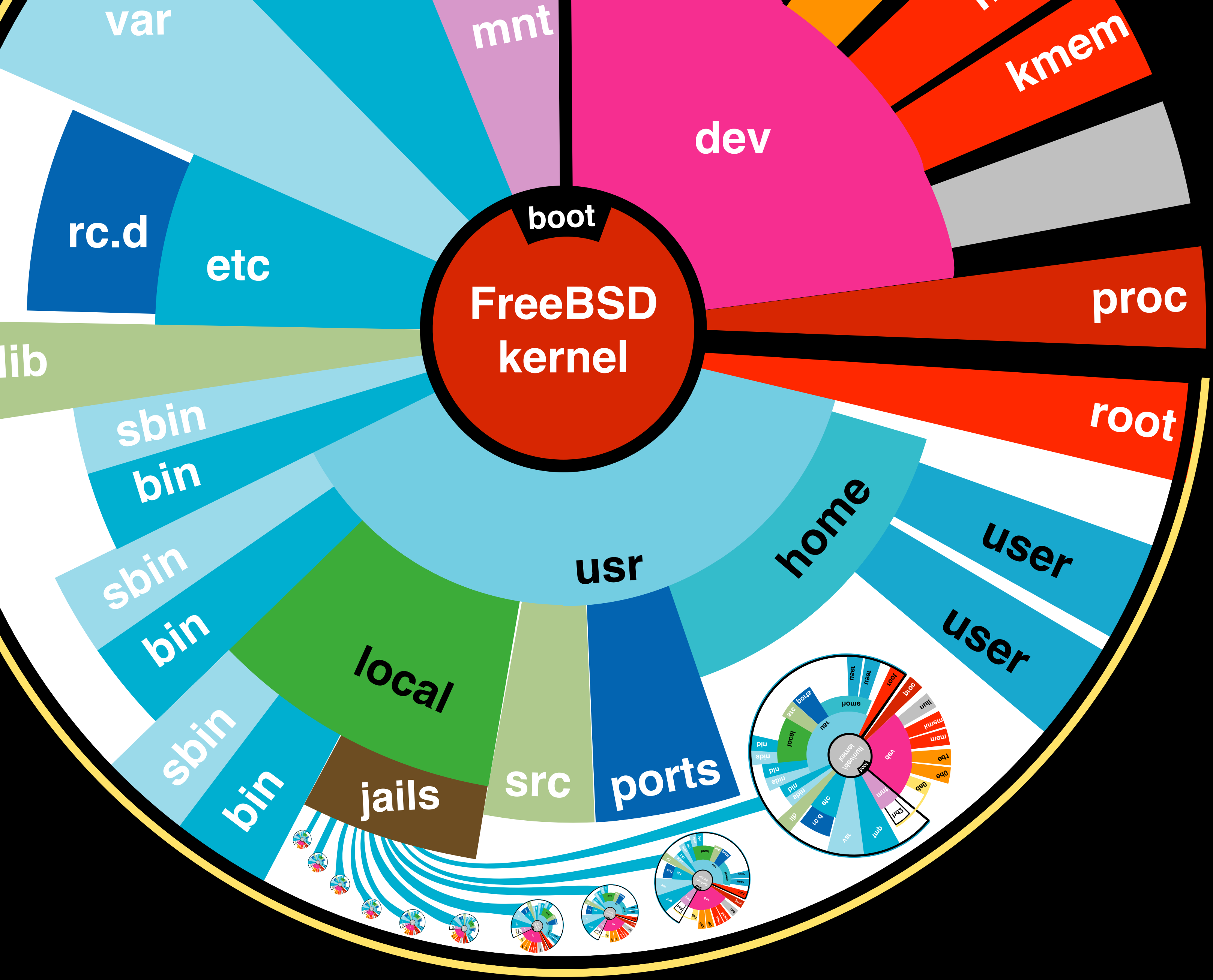


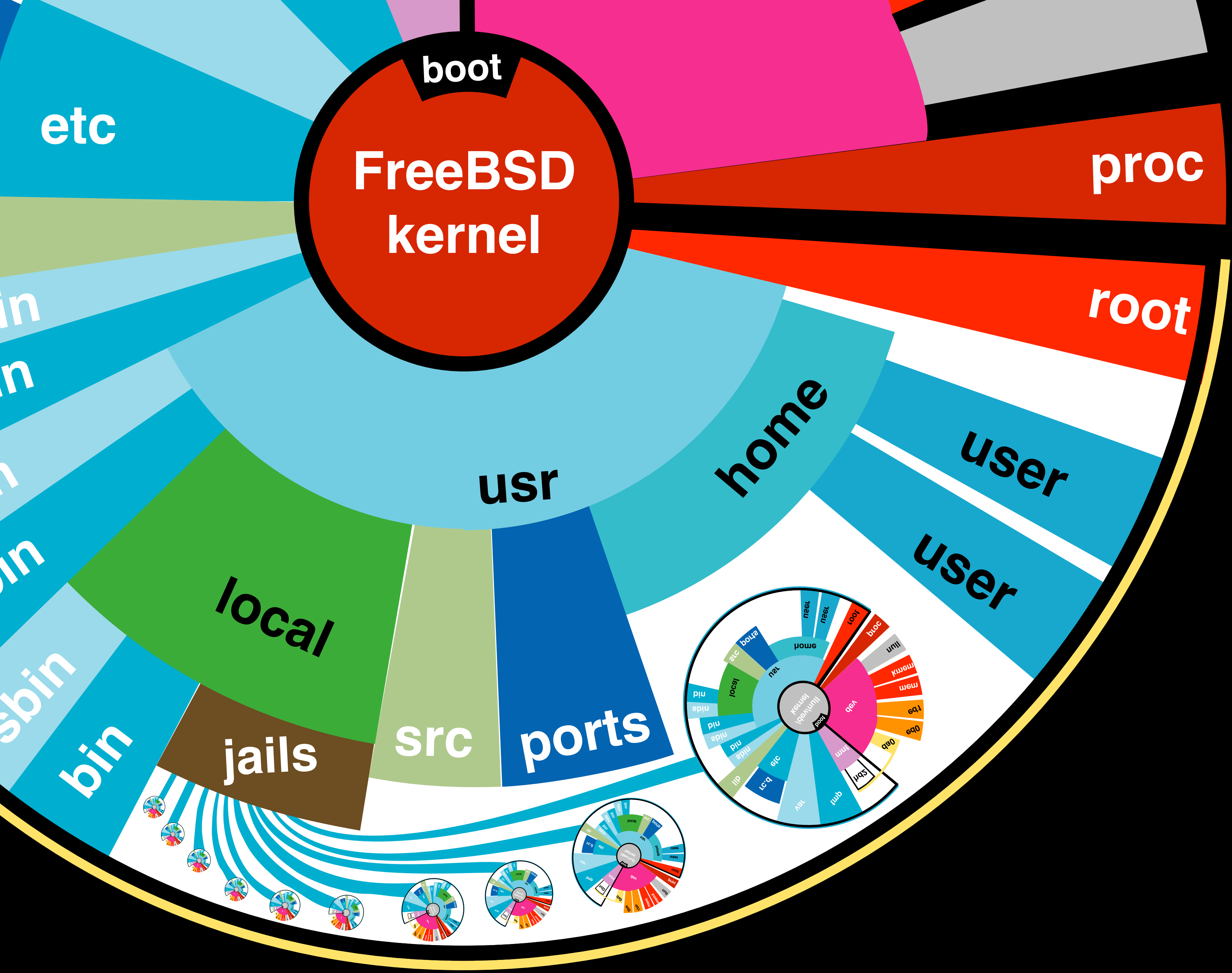
Mandelbrot Fractal - Julia set

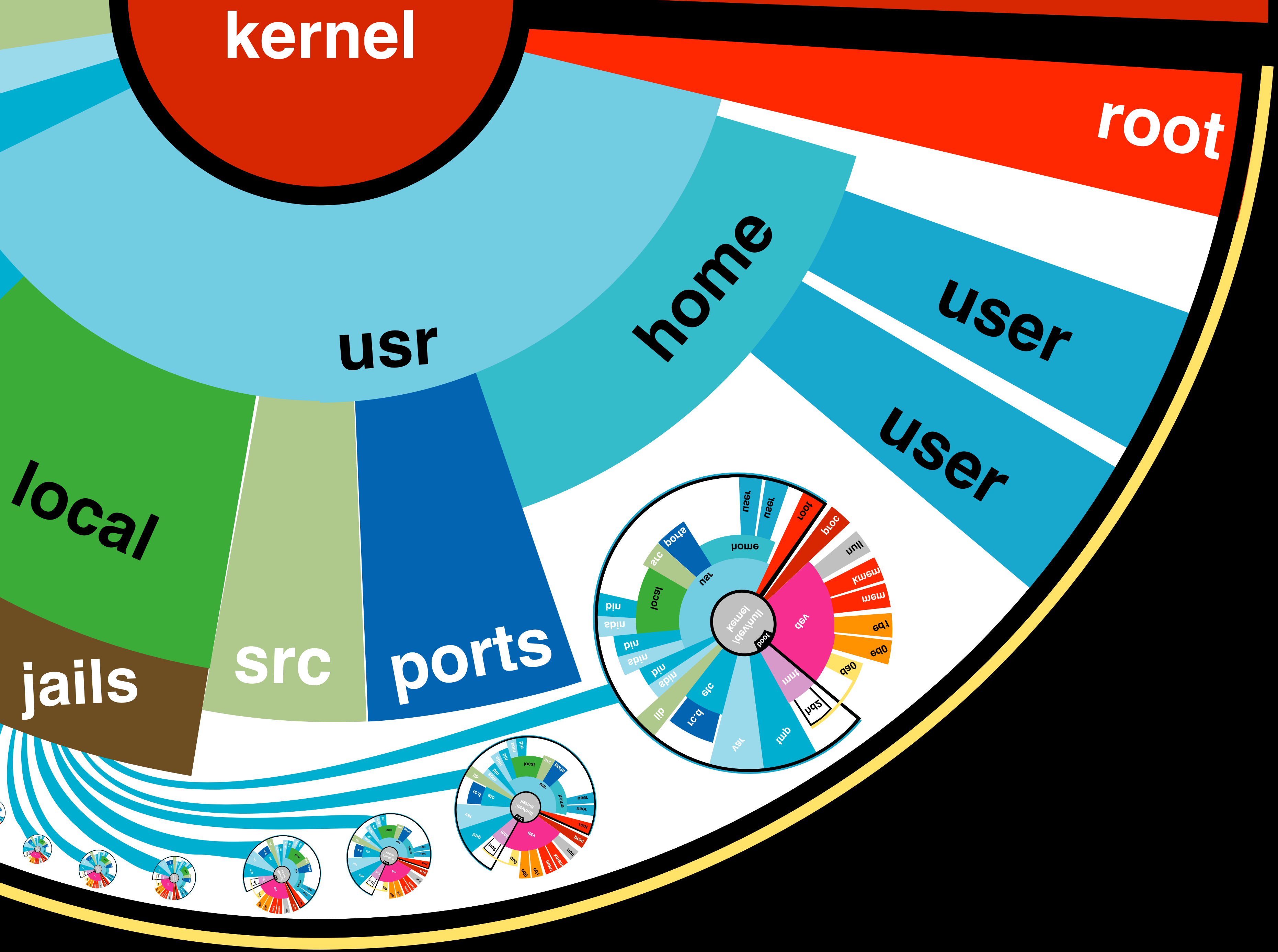


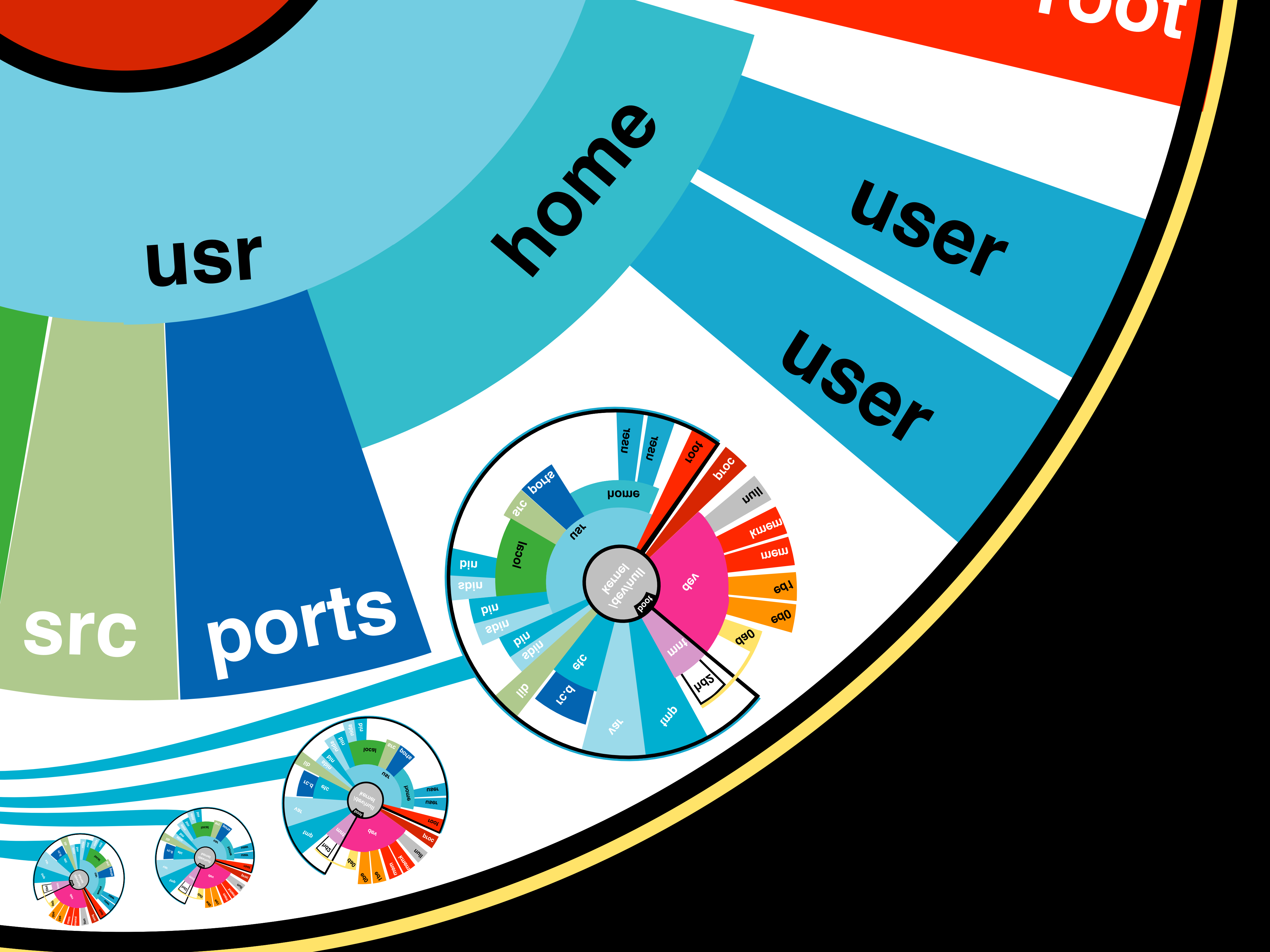
virtual UNIX’s

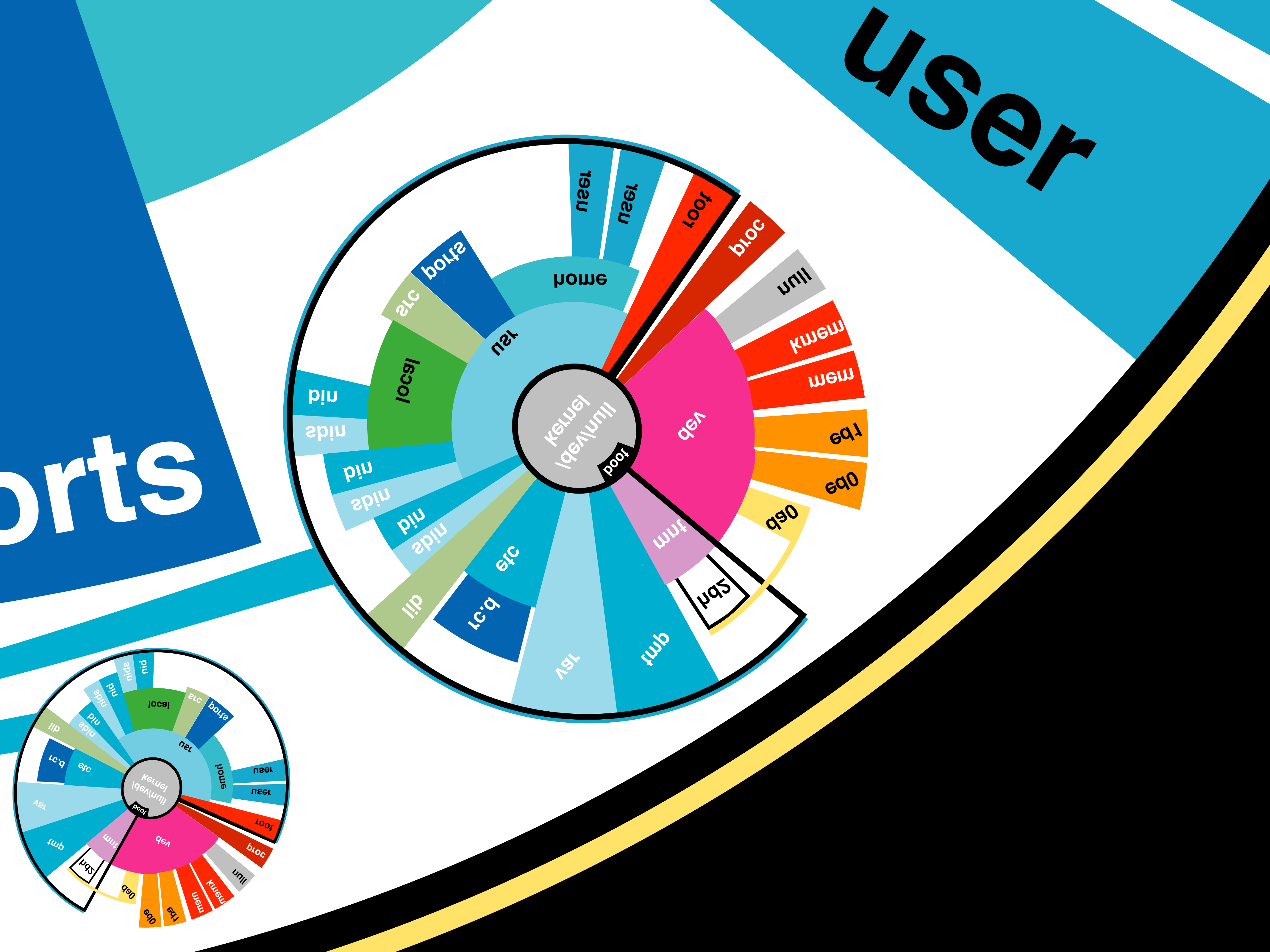

tmp
hd2
var
mnt
da0
ed0
ed1
mem
kmem
dev
boot
FreeBSD kernel
rc.d
etc
proc
lib
root
sbin
bin
sbin
bin
usr
home
user
user
sbin
bin
local
jails
src
ports

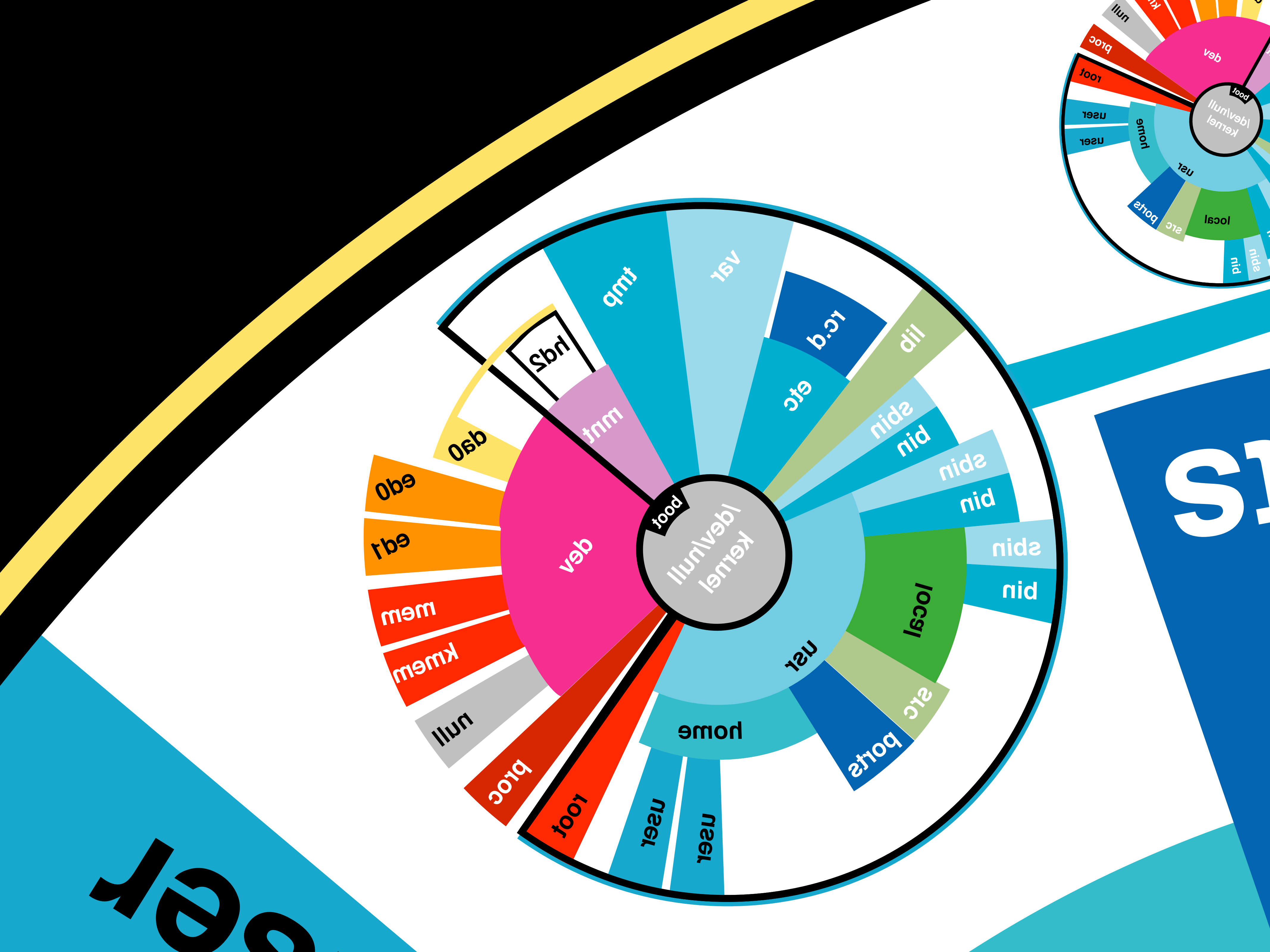

var
mnt
dev
kmem
rc.d
etc
boot
FreeBSD kernel
proc
lib
sbin
bin
root
usr
home
user
user
sbin
bin
local
sbin
bin
jails
src
ports


boot
FreeBSD kernel
etc
proc
root
usr
home
user
user
local
src
ports
jails
sbin
bin


kernel
root
usr
home
user
user
local
jails
src
ports

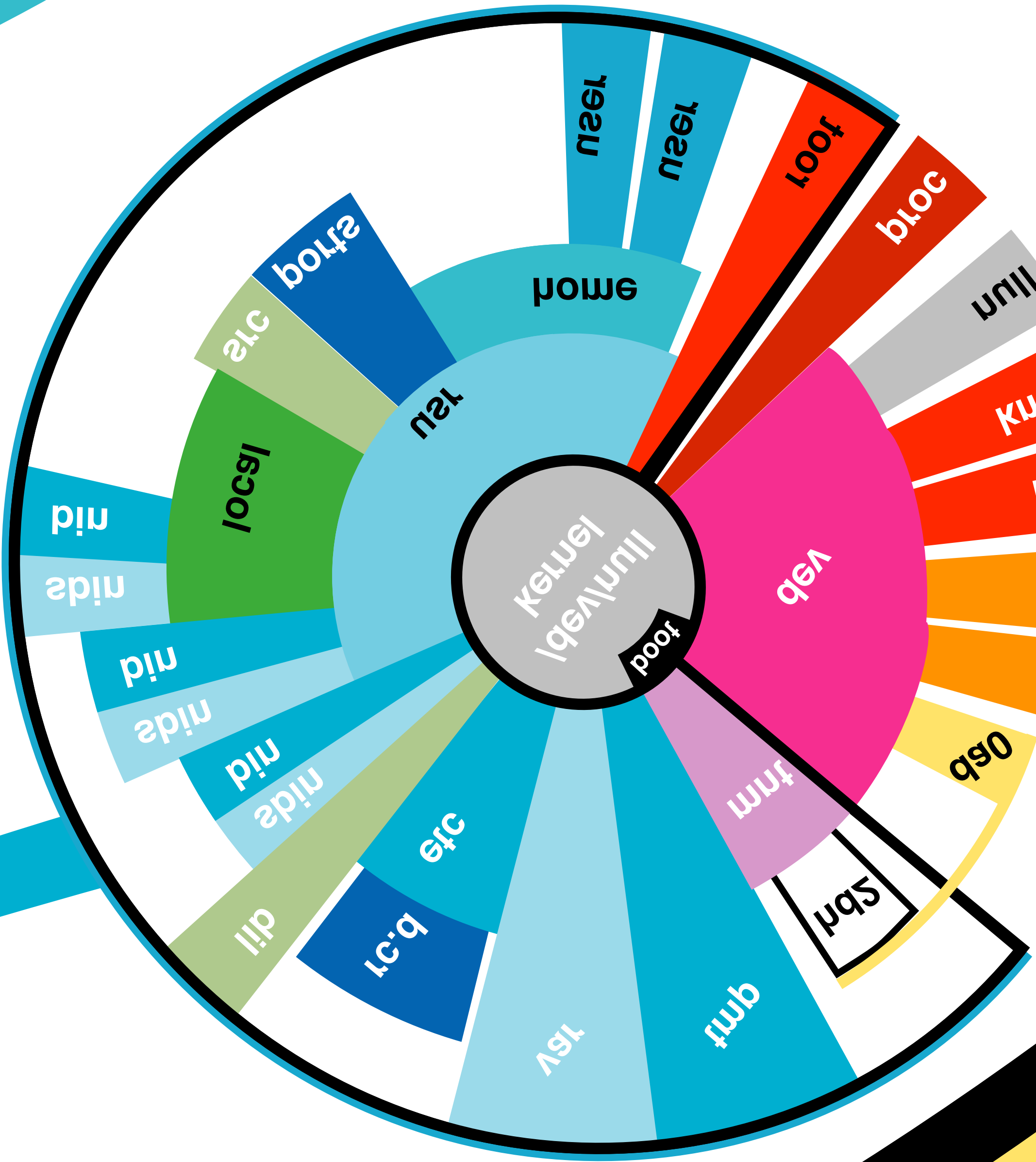

root
usr
home
user
user
src
ports
kernel
/dev/null
boot
dev
root
proc
null
kmem
mem
mnt
tmp
var
rc.d
etc
lib
sbin
bin
local
src
ports
home
user
user

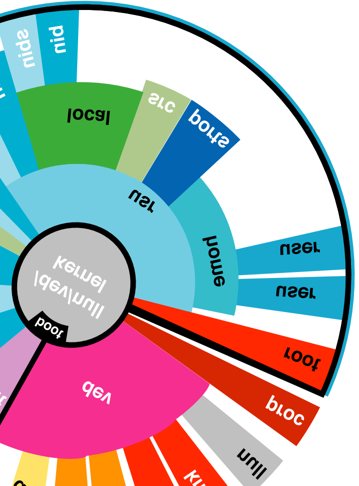

user
orts
kernel
/dev/null
boot
usr
home
user
user
root
proc
null
kmem
mem
ed1
ed0
da0
dev
mnt
tmp
var
etc
rc.d
lib
sbin
bin
sbin
bin
sbin
bin
local
src
ports


ser
ts
/dev/null kernel
boot
dev
ad0
ed0
ed1
mem
kmem
null
proc
root
user
user
home
usr
ports
src
local
bin
sbin
bin
sbin
bin
sbin
lib
etc
rc.d
var
tmp
mnt
hd2

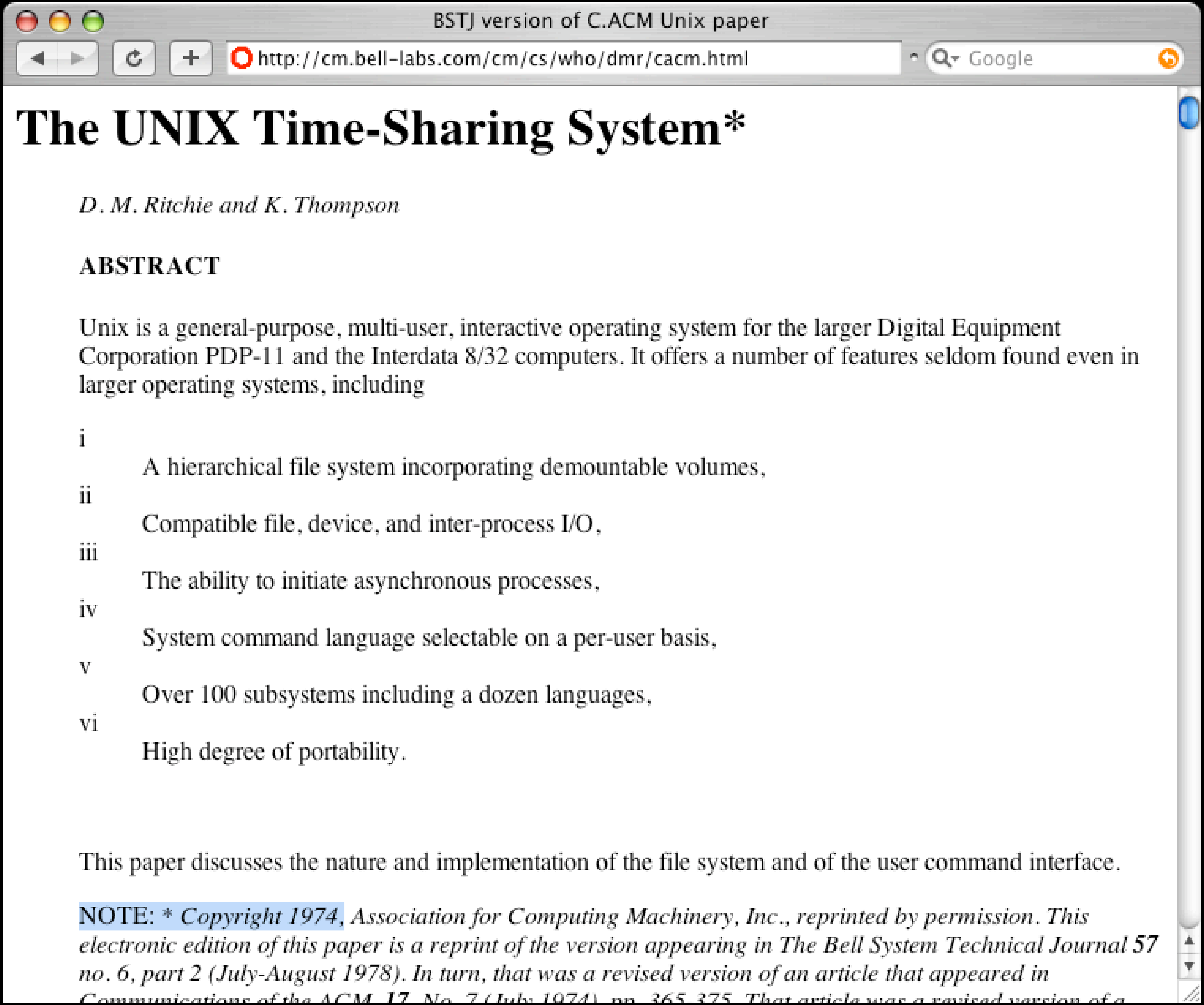
ser

ts





virtual
UNIX's


BSTJ version of C.ACM Unix paper
http://cm.bell-labs.com/cm/cs/who/dmr/cacm.html
Google

The UNIX Time-Sharing System*

D. M. Ritchie and K. Thompson

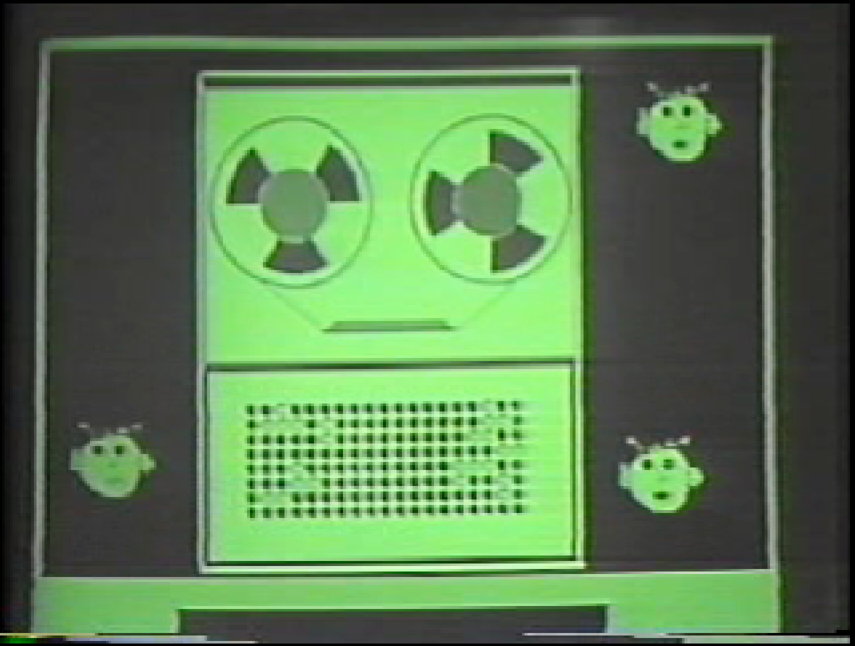
ABSTRACT

Unix is a general-purpose, multi-user, interactive operating system for the larger Digital Equipment Corporation PDP-11 and the Interdata 8/32 computers. It offers a number of features seldom found even in larger operating systems, including

i
A hierarchical file system incorporating demountable volumes,
ii
Compatible file, device, and inter-process I/O,
iii
The ability to initiate asynchronous processes,
iv
System command language selectable on a per-user basis,
v
Over 100 subsystems including a dozen languages,
vi
High degree of portability.

This paper discusses the nature and implementation of the file system and of the user command interface.

NOTE: * *Copyright 1974, Association for Computing Machinery, Inc., reprinted by permission. This electronic edition of this paper is a reprint of the version appearing in The Bell System Technical Journal* **57** *no. 6, part 2 (July-August 1978). In turn, that was a revised version of an article that appeared in Communications of the ACM* **17***, No. 7 (July 1974), pp. 365-375. That article was a revised version of a*



You get the idea-

So what real-world contexts warrant virtualizing the ENTIRE operating system?

external
security
threats

development
messes

Mutually Untrusted Users

Mutually Untrusted Users

Mutually Untrusted Users

Mutually Untrusted Users

telnet forever!

Mutually Untrusted Users

login:admin
pass:love

Moron: Using an electric tool, in a pool, with a metal ladder.
Stupid Moron: Standing barefoot on the ladder while doing it.

su
24/7 ?

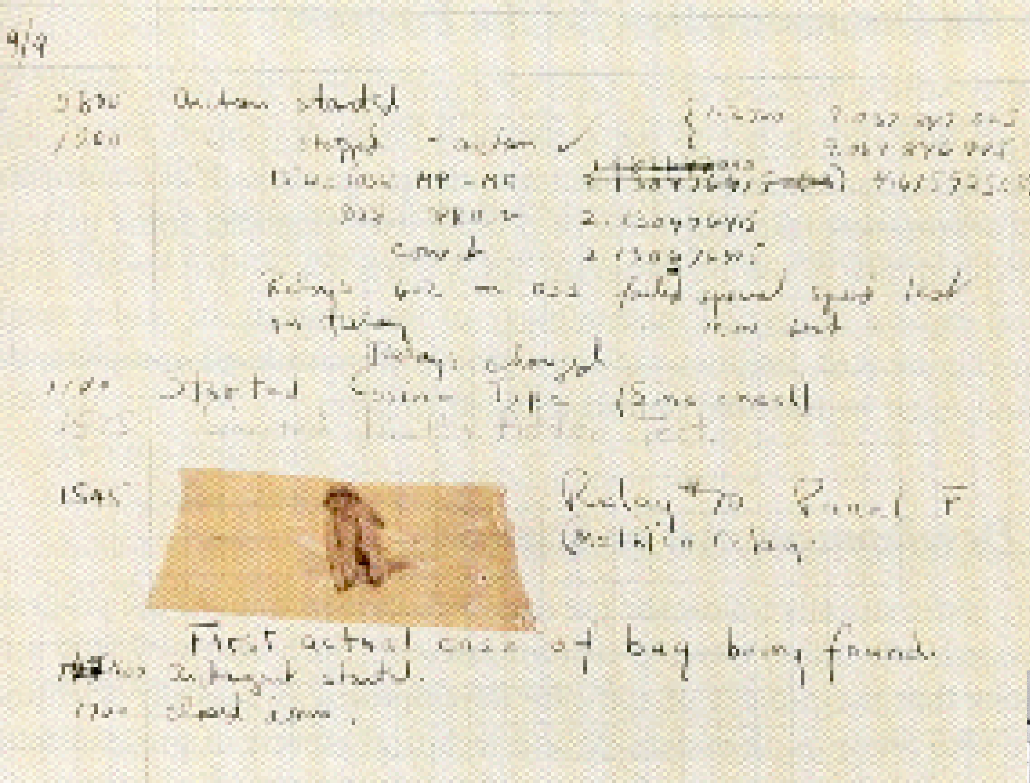
Mutually Untrusted Users

Mutually Untrusted Users

Mutually Untrusted Users

You run
WHAT as
CGI?

Mutually Untrusted Users



9/9

0800 Antran started

Relays changed

1100 Started Cosine Tape (Sine check)

1545 Relay #70 Panel F (moth) in relay.

First actual case of bug being found.

1630 Antran started.

1700 closed down.

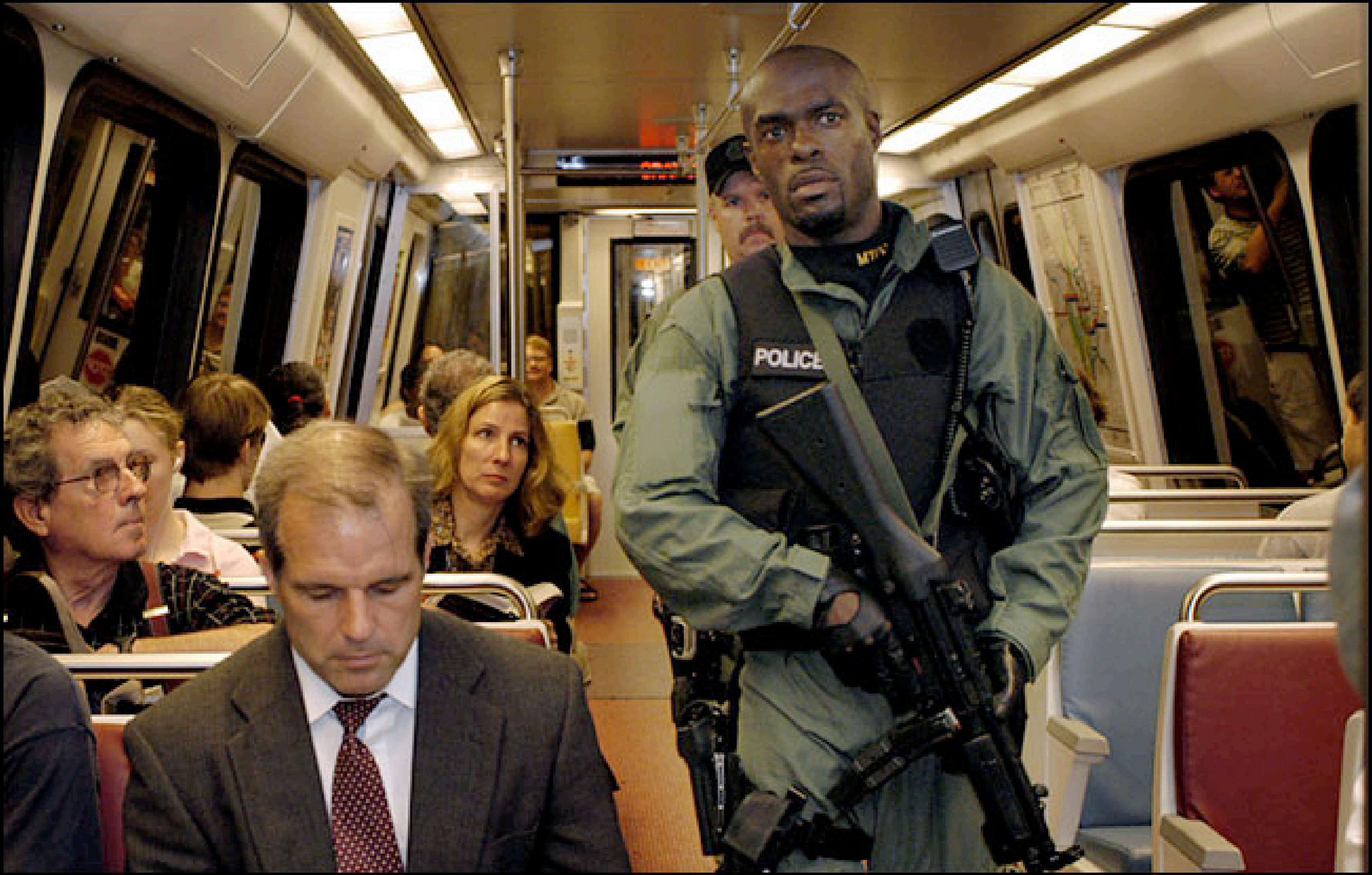
programs are users too...

Mutually Untrusted Users

muscle memory kills!

SOME ASSHOLE TALKING
ON HIS CELL PHONE
GOT CREAMED
9304

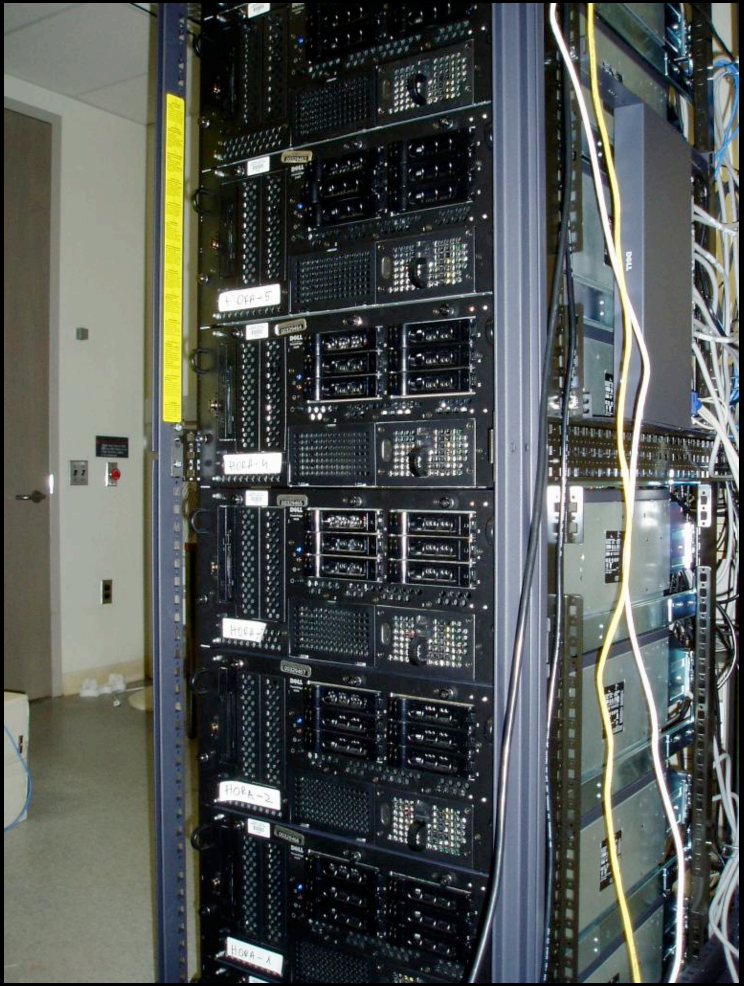
Harmony.



Once upon a time, wasn't UNIX *fun*?

http://mckusick.com/beastie/

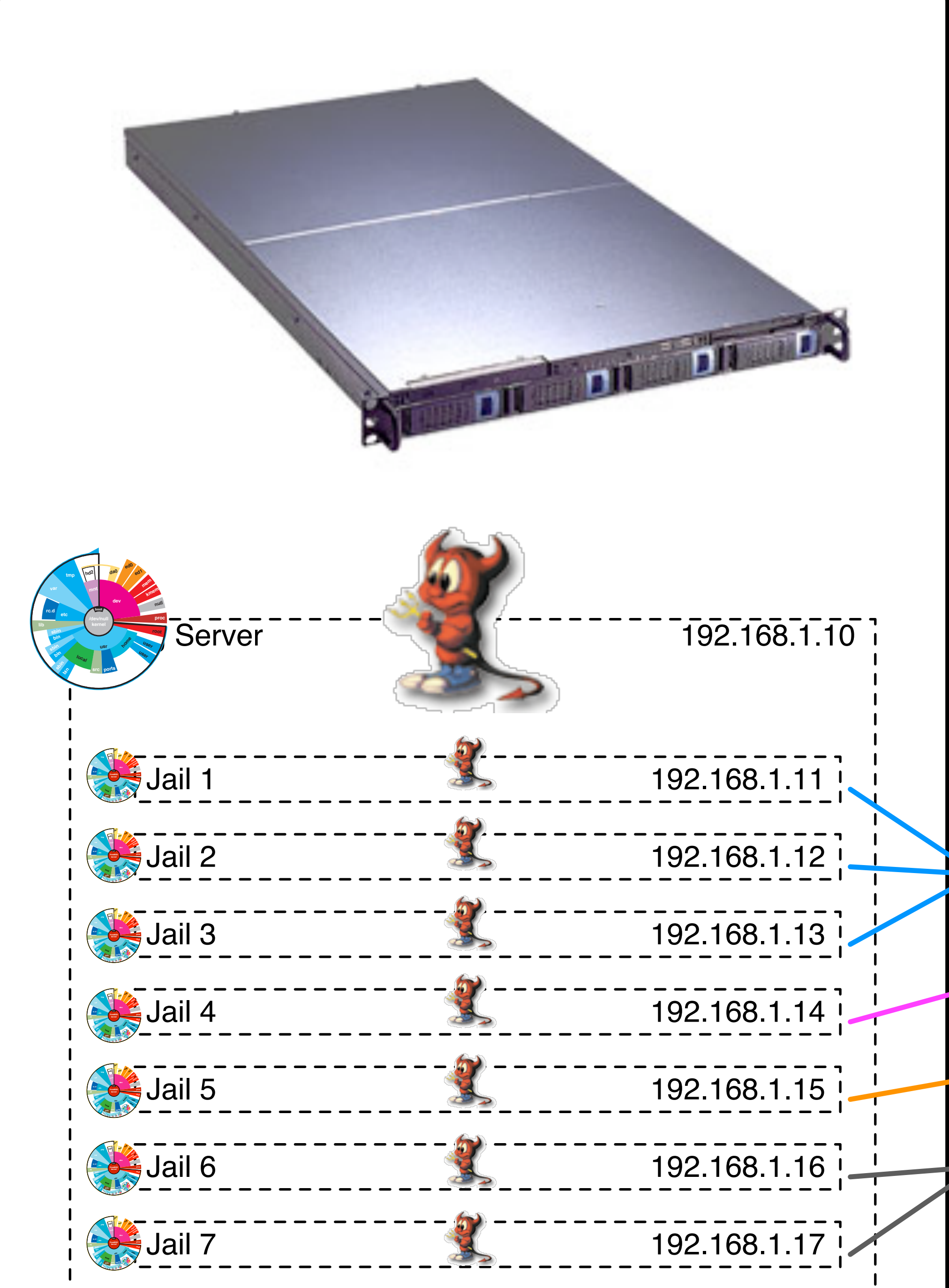
maintaining old junk?



Rack full of stuff Example:

- 3 webservers
- 1 local-use dns cache
- fileserver (for 2 people)
- 2 dev servers

jail(8)!



Server 192.168.1.10

Jail 1 192.168.1.11

Jail 2 192.168.1.12

Jail 3 192.168.1.13

Jail 4 192.168.1.14

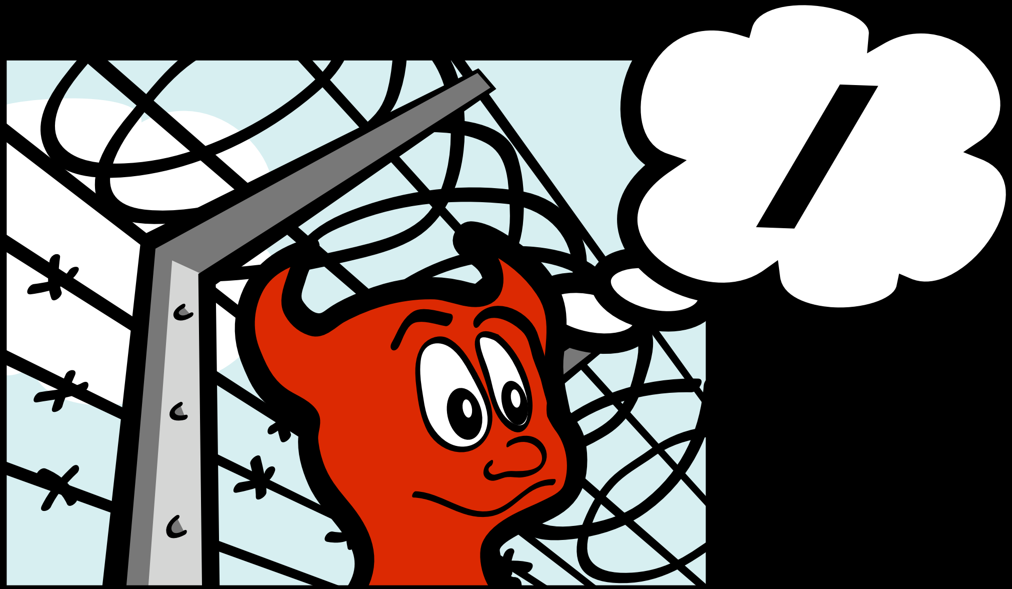
Jail 5 192.168.1.15

Jail 6 192.168.1.16

Jail 7 192.168.1.17

**Rack full of stuff ,
becomes 1u server!**

3 webservers
1 local-use dns cache
fileserver (for 2 people)
2 dev servers



jail(8)

Definitions

- what is a jail(8):
  - a user space utility, like ifconfig(8)
  - produces a virtual system image
  - process tree based
- what is jail(2):
  - a system call to imprison a process
  - it calls chroot and attaches to IP
  - a very few lines of source code!

Definitions

- what jail is ***not***:
  - it is **not** a classical machine emulator
  - it is **not** chroot (‘jail’ vocabulary is commonly misused with other *NIX cultures)

Great Uses for **jail(8)**

- hardware resource sharing, an entire OS can be dedicated to a given service
- securely separate untrusted users/processes
- learning/development/testing/hacking
- insane high availability possibilities
- honeypots
- highly vulnerable network services

Poor Uses for **jail(8)**

- kernel access (you don’t get a kernel)
- limited network interface access
- limited device driver access
- when chroot(8) will simply do the job
- some applications require particular low-level system calls:
  - Notably, PostgreSQL doesn’t run (securely) in jails based on SysV IPC

How To **jail(8)**

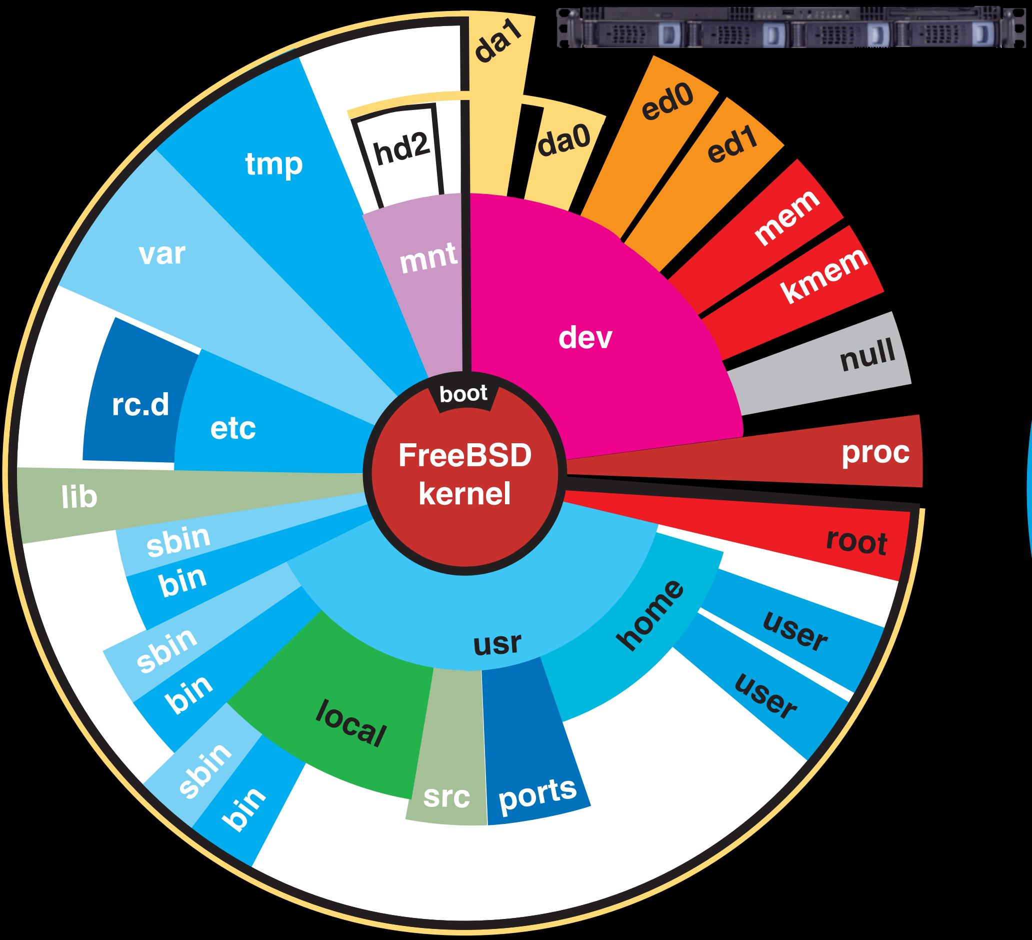
- DEFINITIVE instructions in **jail man pages**,

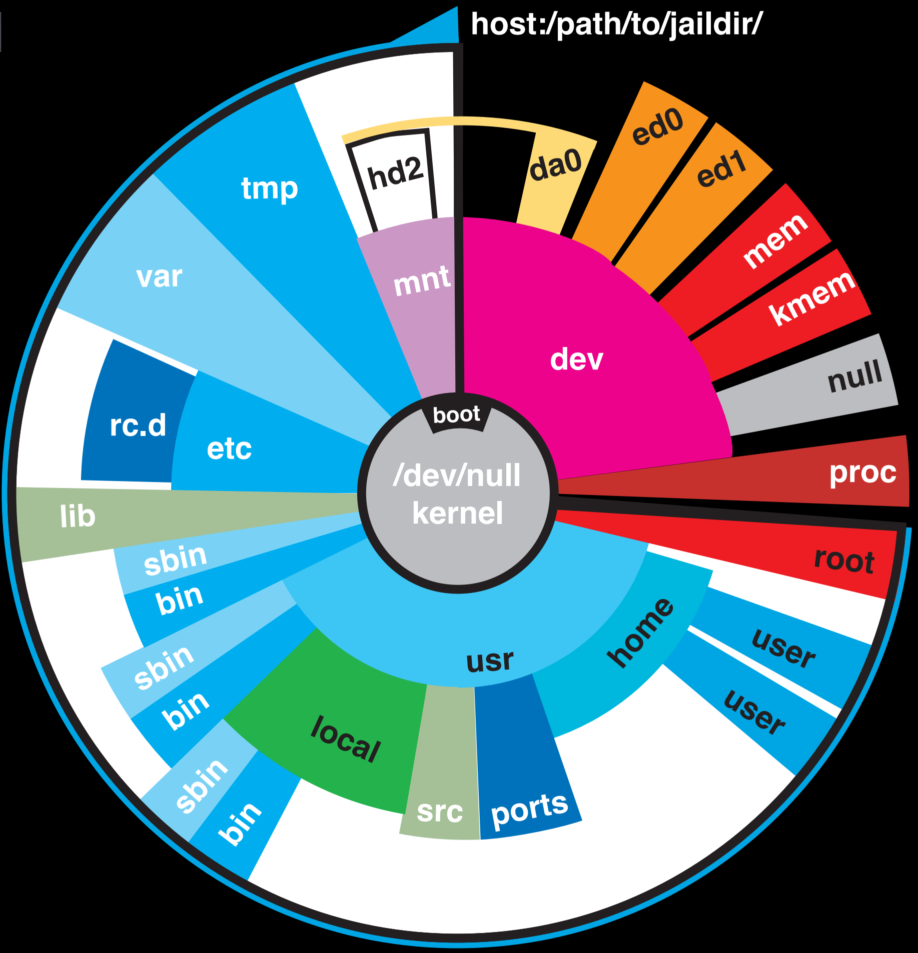
  1. compile a FreeBSD userland from source somewhere on host machine, minor tweaks.

  2. create an IP alias on a network interface

  3. run the jail(8) call with the IP, and userland, to ‘boot’ the jail, (so to speak).

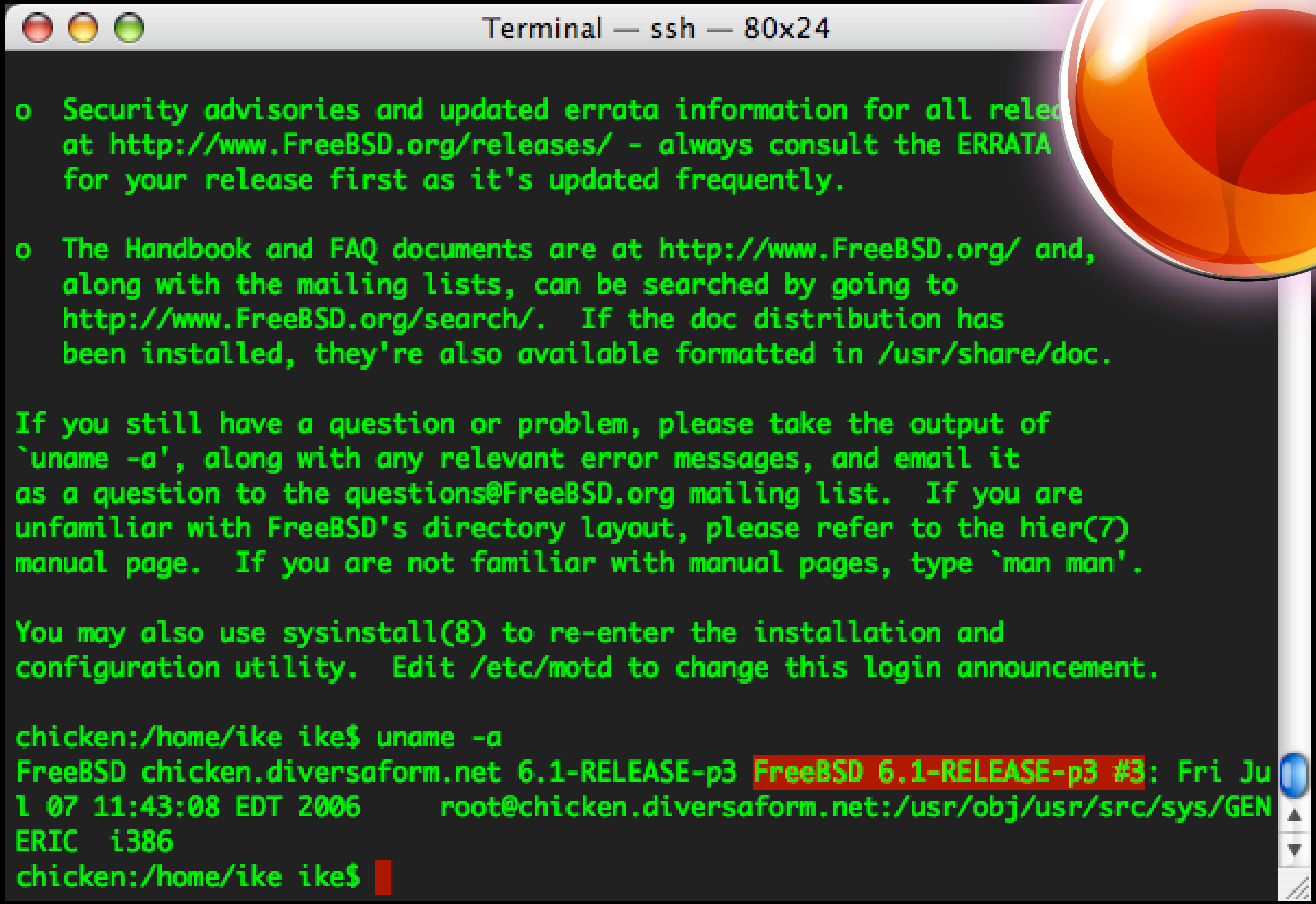
Practical Comparison





making a jail

Host Machine



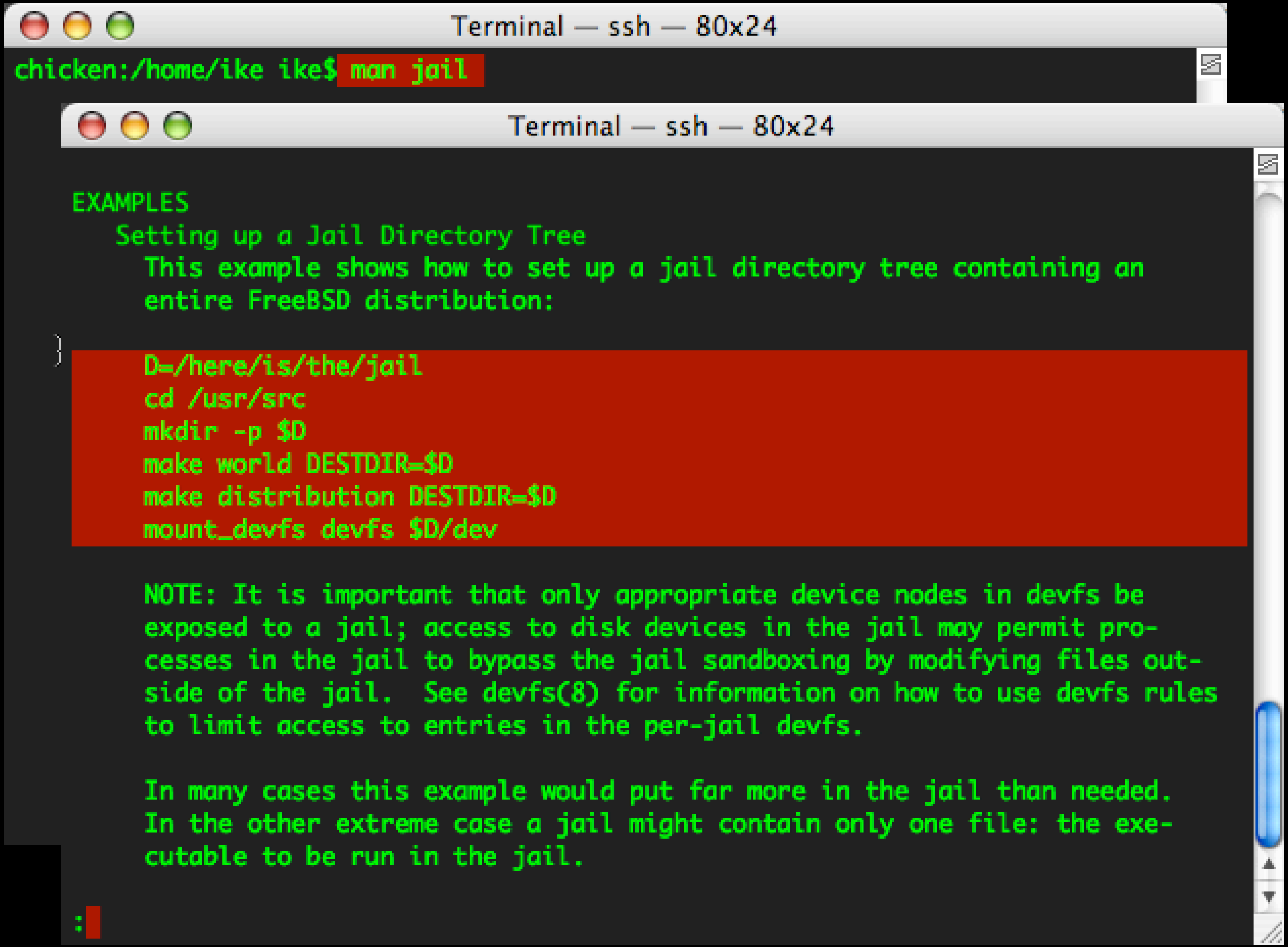
```
o  Security advisories and updated errata information for all rele
   at http://www.FreeBSD.org/releases/ - always consult the ERRATA
   for your release first as it's updated frequently.

o  The Handbook and FAQ documents are at http://www.FreeBSD.org/ and,
   along with the mailing lists, can be searched by going to
   http://www.FreeBSD.org/search/.  If the doc distribution has
   been installed, they're also available formatted in /usr/share/doc.

If you still have a question or problem, please take the output of
`uname -a', along with any relevant error messages, and email it
as a question to the questions@FreeBSD.org mailing list.  If you are
unfamiliar with FreeBSD's directory layout, please refer to the hier(7)
manual page.  If you are not familiar with manual pages, type `man man'.

You may also use sysinstall(8) to re-enter the installation and
configuration utility.  Edit /etc/motd to change this login announcement.

chicken:/home/ike ike$ uname -a
FreeBSD chicken.diversaform.net 6.1-RELEASE-p3 FreeBSD 6.1-RELEASE-p3 #3: Fri Ju
l 07 11:43:08 EDT 2006     root@chicken.diversaform.net:/usr/obj/usr/src/sys/GEN
ERIC  i386
chicken:/home/ike ike$ 
```

preflight (simple)

1. get source to build with (cvsup is great)
2. make somewhere for the jails to live (partitions, disk mounts, etc...)
3. make somewhere for jail-related start/mgmt scripts to live

(starting jails from **/etc/rc.d/jail** can **thrash violently** in most contexts! Bad!)

preflight- (man, definitive)

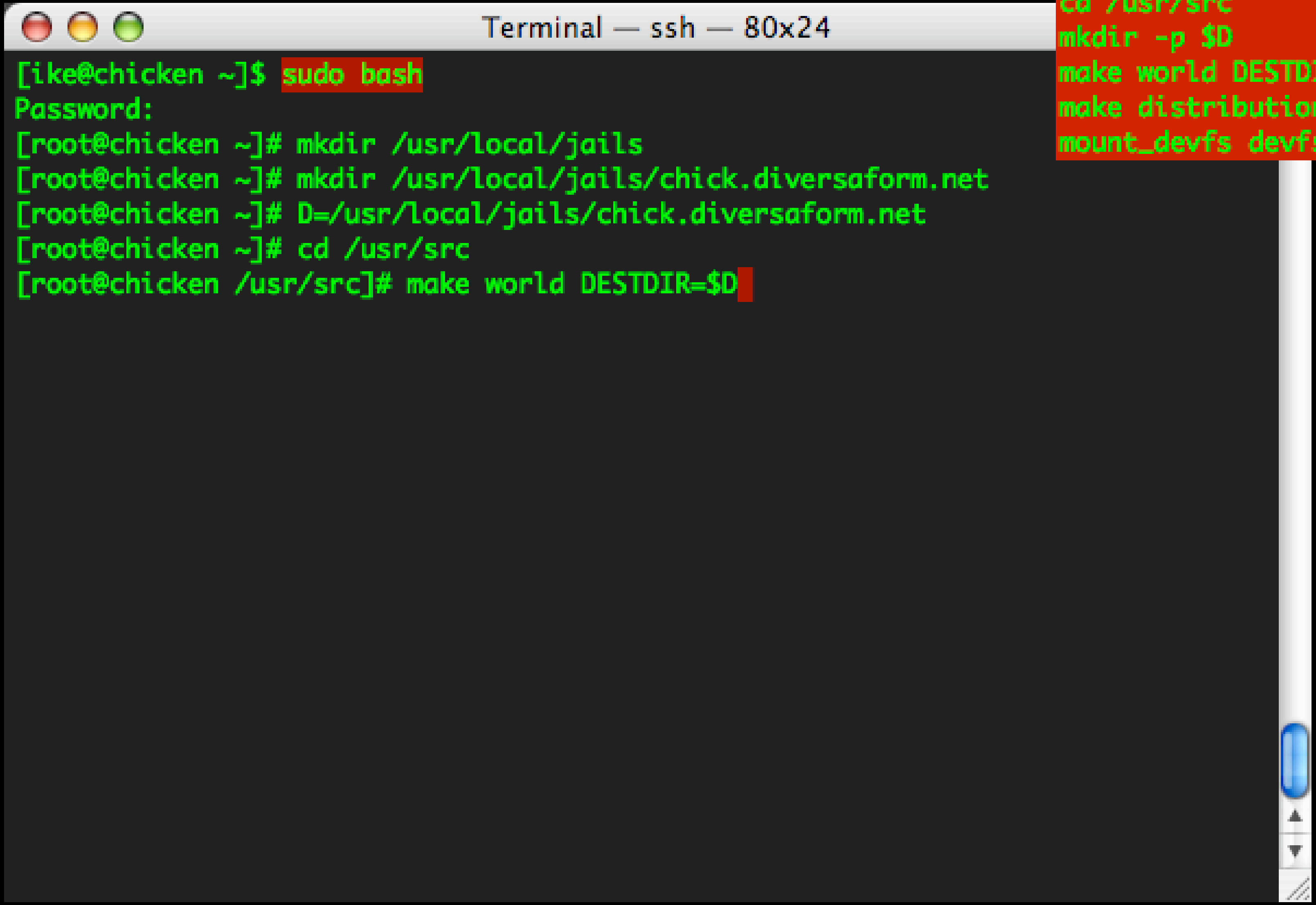


```
chicken:/home/ike ike$ man jail
```

```
EXAMPLES
   Setting up a Jail Directory Tree
     This example shows how to set up a jail directory tree containing an
     entire FreeBSD distribution:

     D=/here/is/the/jail
     cd /usr/src
     mkdir -p $D
     make world DESTDIR=$D
     make distribution DESTDIR=$D
     mount_devfs devfs $D/dev

     NOTE: It is important that only appropriate device nodes in devfs be
     exposed to a jail; access to disk devices in the jail may permit pro-
     cesses in the jail to bypass the jail sandboxing by modifying files out-
     side of the jail.  See devfs(8) for information on how to use devfs rules
     to limit access to entries in the per-jail devfs.

     In many cases this example would put far more in the jail than needed.
     In the other extreme case a jail might contain only one file: the exe-
     cutable to be run in the jail.

:
```

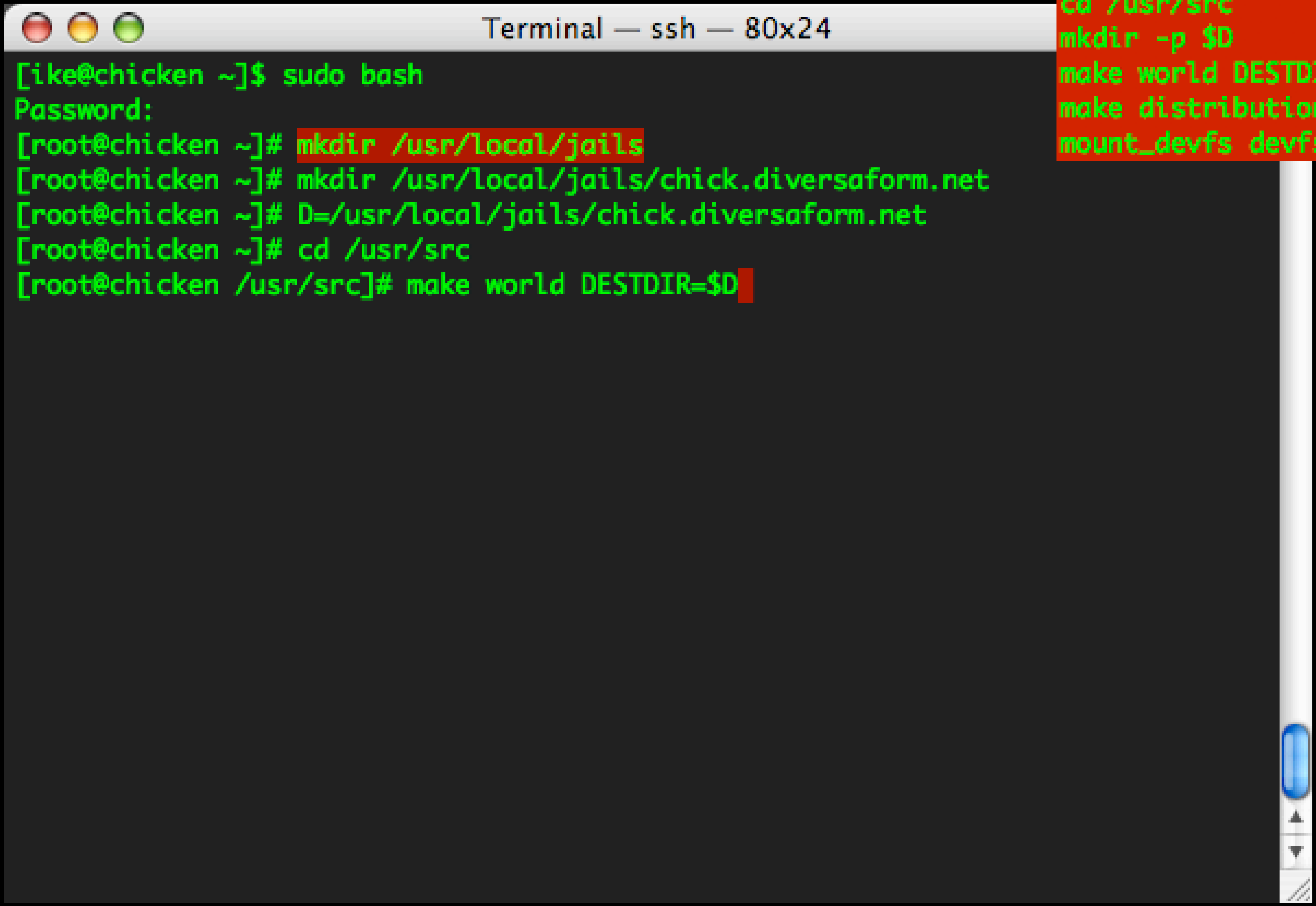
preflight- (build from src)

```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```



```
[ike@chicken ~]$ sudo bash
Password:
[root@chicken ~]# mkdir /usr/local/jails
[root@chicken ~]# mkdir /usr/local/jails/chick.diversaform.net
[root@chicken ~]# D=/usr/local/jails/chick.diversaform.net
[root@chicken ~]# cd /usr/src
[root@chicken /usr/src]# make world DESTDIR=$D
```

preflight- (build from src)

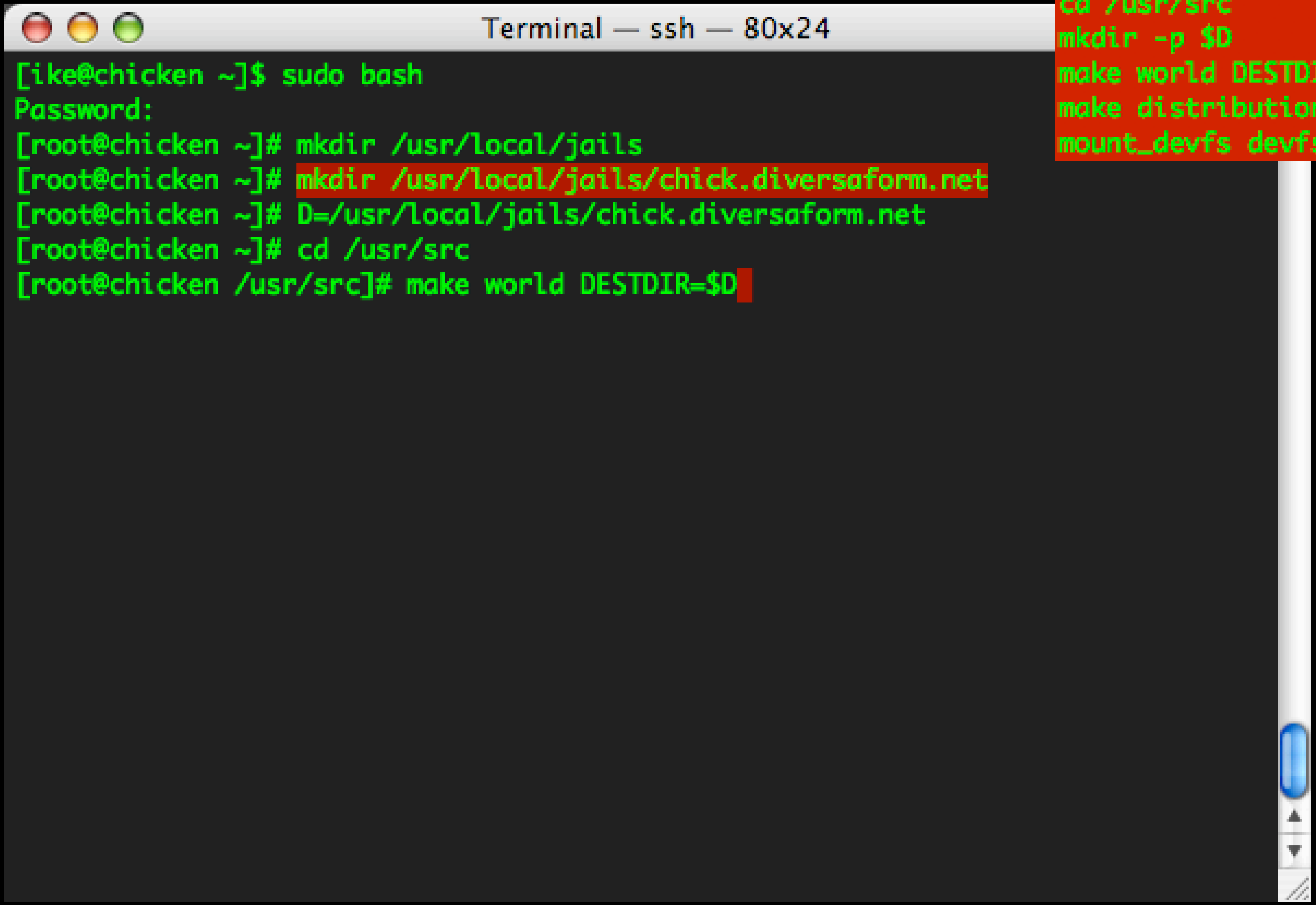


```
[ike@chicken ~]$ sudo bash
Password:
[root@chicken ~]# mkdir /usr/local/jails
[root@chicken ~]# mkdir /usr/local/jails/chick.diversaform.net
[root@chicken ~]# D=/usr/local/jails/chick.diversaform.net
[root@chicken ~]# cd /usr/src
[root@chicken /usr/src]# make world DESTDIR=$D
```

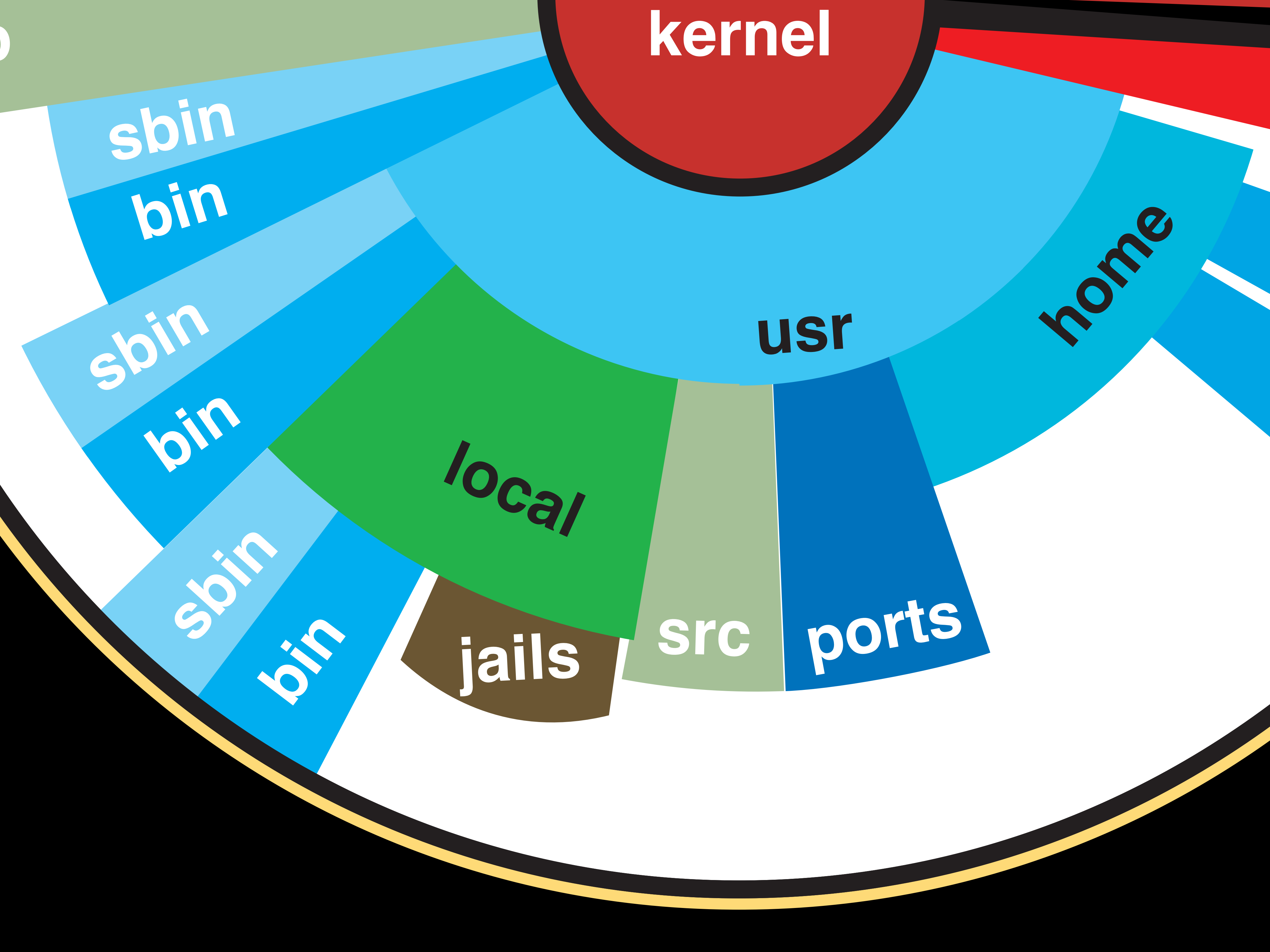
```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```

preflight- (build from src)

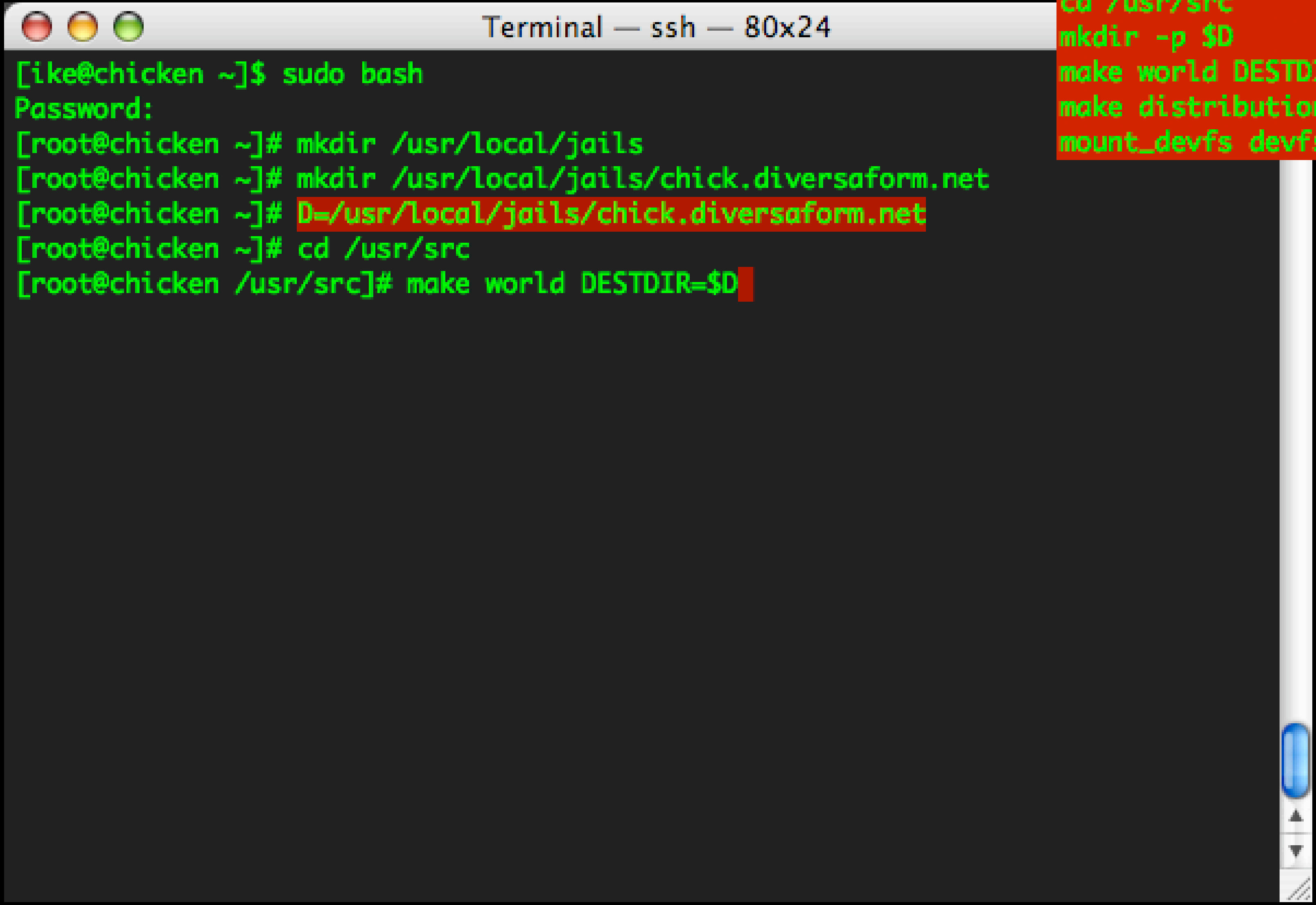
```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```



```
[ike@chicken ~]$ sudo bash
Password:
[root@chicken ~]# mkdir /usr/local/jails
[root@chicken ~]# mkdir /usr/local/jails/chick.diversaform.net
[root@chicken ~]# D=/usr/local/jails/chick.diversaform.net
[root@chicken ~]# cd /usr/src
[root@chicken /usr/src]# make world DESTDIR=$D
```

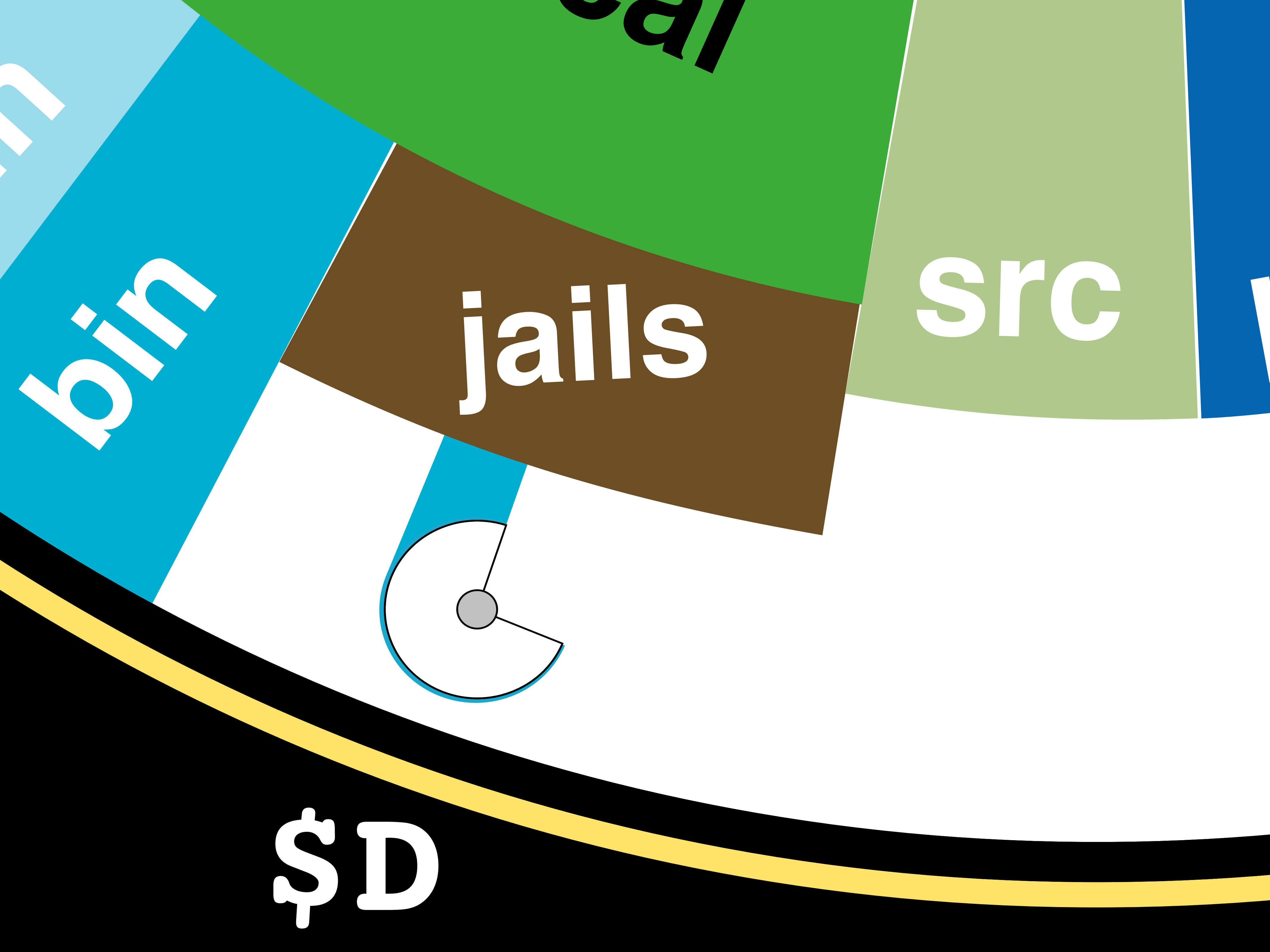

kernel
sbin
bin
sbin
bin
sbin
bin
usr
home
local
jails
src
ports

preflight- (build from src)

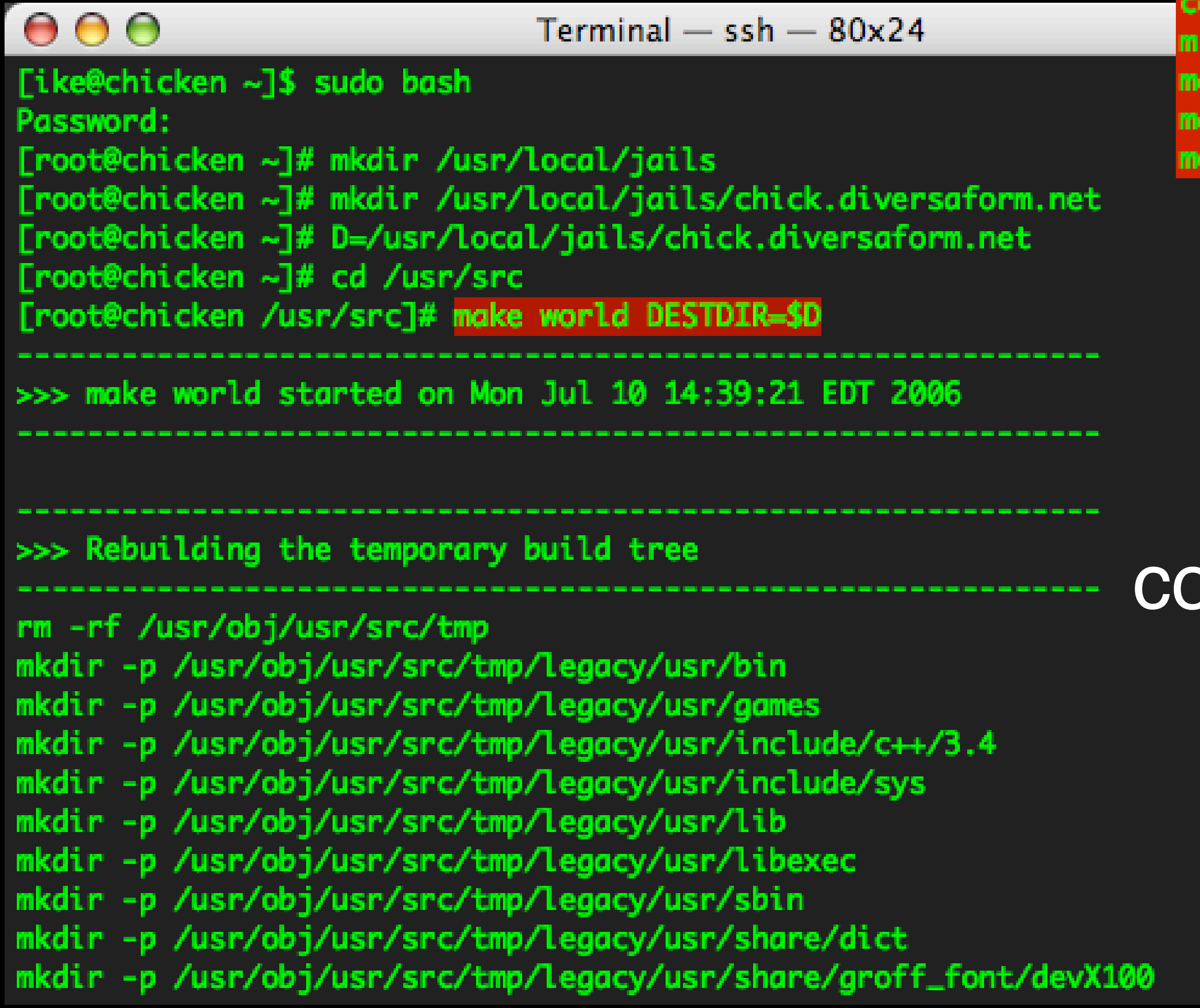


```
[ike@chicken ~]$ sudo bash
Password:
[root@chicken ~]# mkdir /usr/local/jails
[root@chicken ~]# mkdir /usr/local/jails/chick.diversaform.net
[root@chicken ~]# D=/usr/local/jails/chick.diversaform.net
[root@chicken ~]# cd /usr/src
[root@chicken /usr/src]# make world DESTDIR=$D
```

```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```


bin
jails
src
$D

preflight- (build from src)

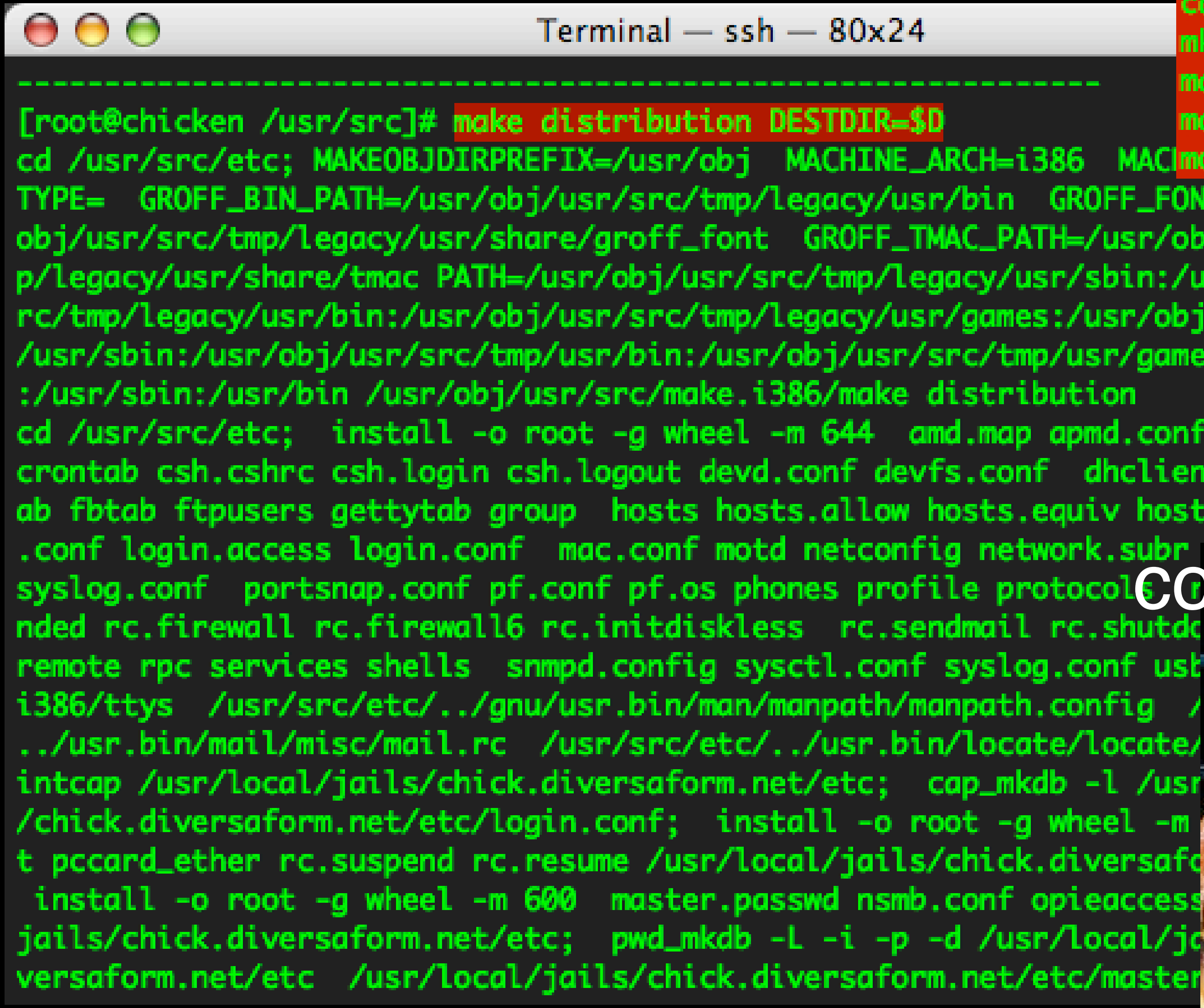


```
[ike@chicken ~]$ sudo bash
Password:
[root@chicken ~]# mkdir /usr/local/jails
[root@chicken ~]# mkdir /usr/local/jails/chick.diversaform.net
[root@chicken ~]# D=/usr/local/jails/chick.diversaform.net
[root@chicken ~]# cd /usr/src
[root@chicken /usr/src]# make world DESTDIR=$D
--------------------------------------------------------------
>>> make world started on Mon Jul 10 14:39:21 EDT 2006
--------------------------------------------------------------


--------------------------------------------------------------
>>> Rebuilding the temporary build tree
--------------------------------------------------------------
rm -rf /usr/obj/usr/src/tmp
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/bin
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/games
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/include/c++/3.4
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/include/sys
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/lib
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/libexec
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/sbin
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/share/dict
mkdir -p /usr/obj/usr/src/tmp/legacy/usr/share/groff_font/devX100
```

```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```

compile!

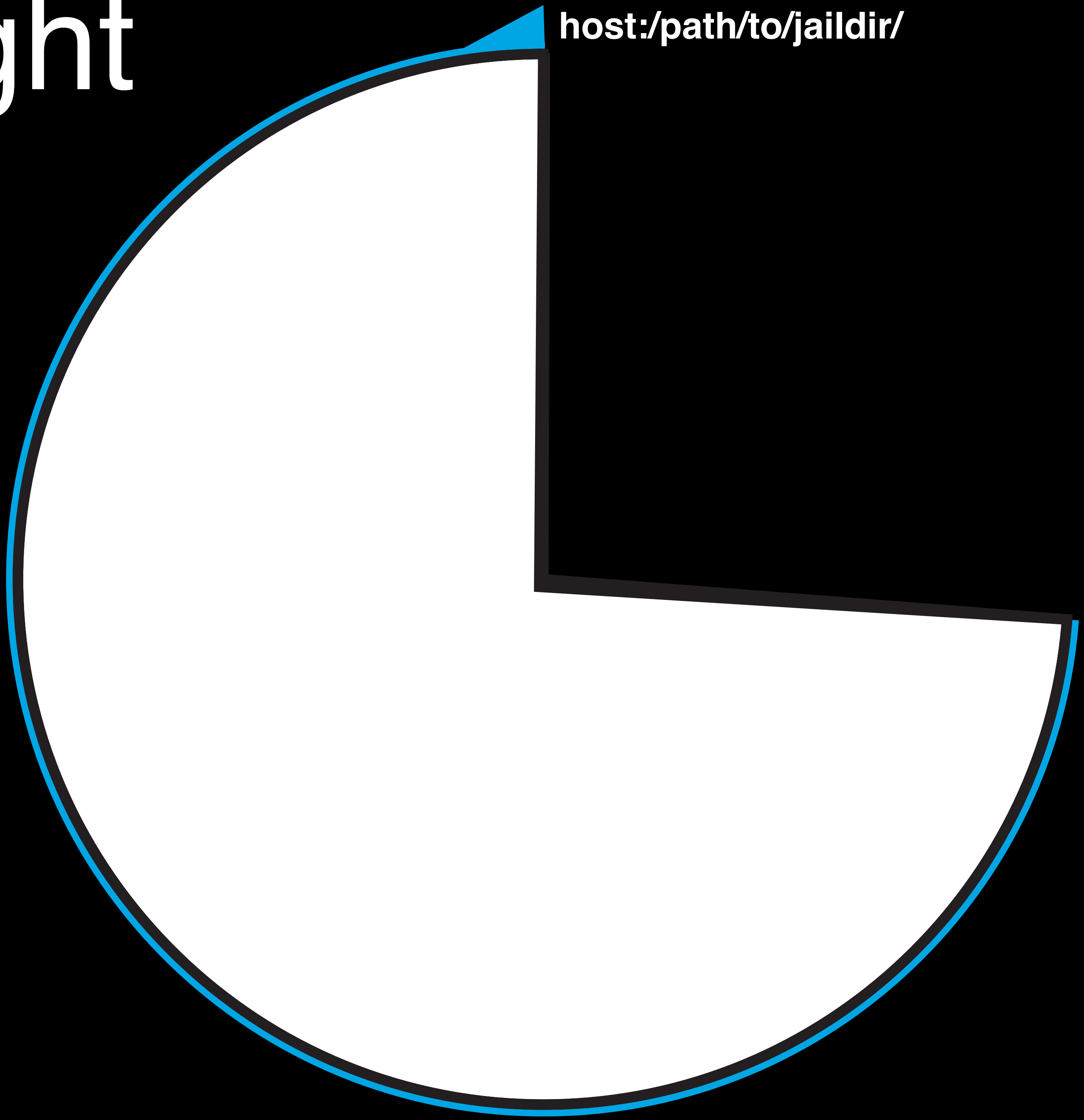
preflight- (build from src)



```
--------------------------------------------------------------
[root@chicken /usr/src]# make distribution DESTDIR=$D
cd /usr/src/etc; MAKEOBJDIRPREFIX=/usr/obj  MACHINE_ARCH=i386  MAC
TYPE=  GROFF_BIN_PATH=/usr/obj/usr/src/tmp/legacy/usr/bin  GROFF_FONT_PATH=/usr/
obj/usr/src/tmp/legacy/usr/share/groff_font  GROFF_TMAC_PATH=/usr/obj/usr/src/tm
p/legacy/usr/share/tmac PATH=/usr/obj/usr/src/tmp/legacy/usr/sbin:/usr/obj/usr/s
rc/tmp/legacy/usr/bin:/usr/obj/usr/src/tmp/legacy/usr/games:/usr/obj/usr/src/tmp
/usr/sbin:/usr/obj/usr/src/tmp/usr/bin:/usr/obj/usr/src/tmp/usr/games:/sbin:/bin
:/usr/sbin:/usr/bin /usr/obj/usr/src/make.i386/make distribution
cd /usr/src/etc;  install -o root -g wheel -m 644  amd.map apmd.conf auth.conf
crontab csh.cshrc csh.login csh.logout devd.conf devfs.conf  dhclient.conf diskt
ab fbtab ftpusers gettytab group  hosts hosts.allow hosts.equiv hosts.lpd  inetd
.conf login.access login.conf  mac.conf motd netconfig network.subr
syslog.conf  portsnap.conf pf.conf pf.os phones profile protocols
nded rc.firewall rc.firewall6 rc.initdiskless  rc.sendmail rc.shutd
remote rpc services shells  snmpd.config sysctl.conf syslog.conf us
i386/ttys  /usr/src/etc/../gnu/usr.bin/man/manpath/manpath.config  /
../usr.bin/mail/misc/mail.rc  /usr/src/etc/../usr.bin/locate/locate/
intcap /usr/local/jails/chick.diversaform.net/etc;  cap_mkdb -l /us
/chick.diversaform.net/etc/login.conf;  install -o root -g wheel -m
t pccard_ether rc.suspend rc.resume /usr/local/jails/chick.diversaf
 install -o root -g wheel -m 600  master.passwd nsmb.conf opieaccess
jails/chick.diversaform.net/etc;  pwd_mkdb -L -i -p -d /usr/local/j
versaform.net/etc  /usr/local/jails/chick.diversaform.net/etc/master
```

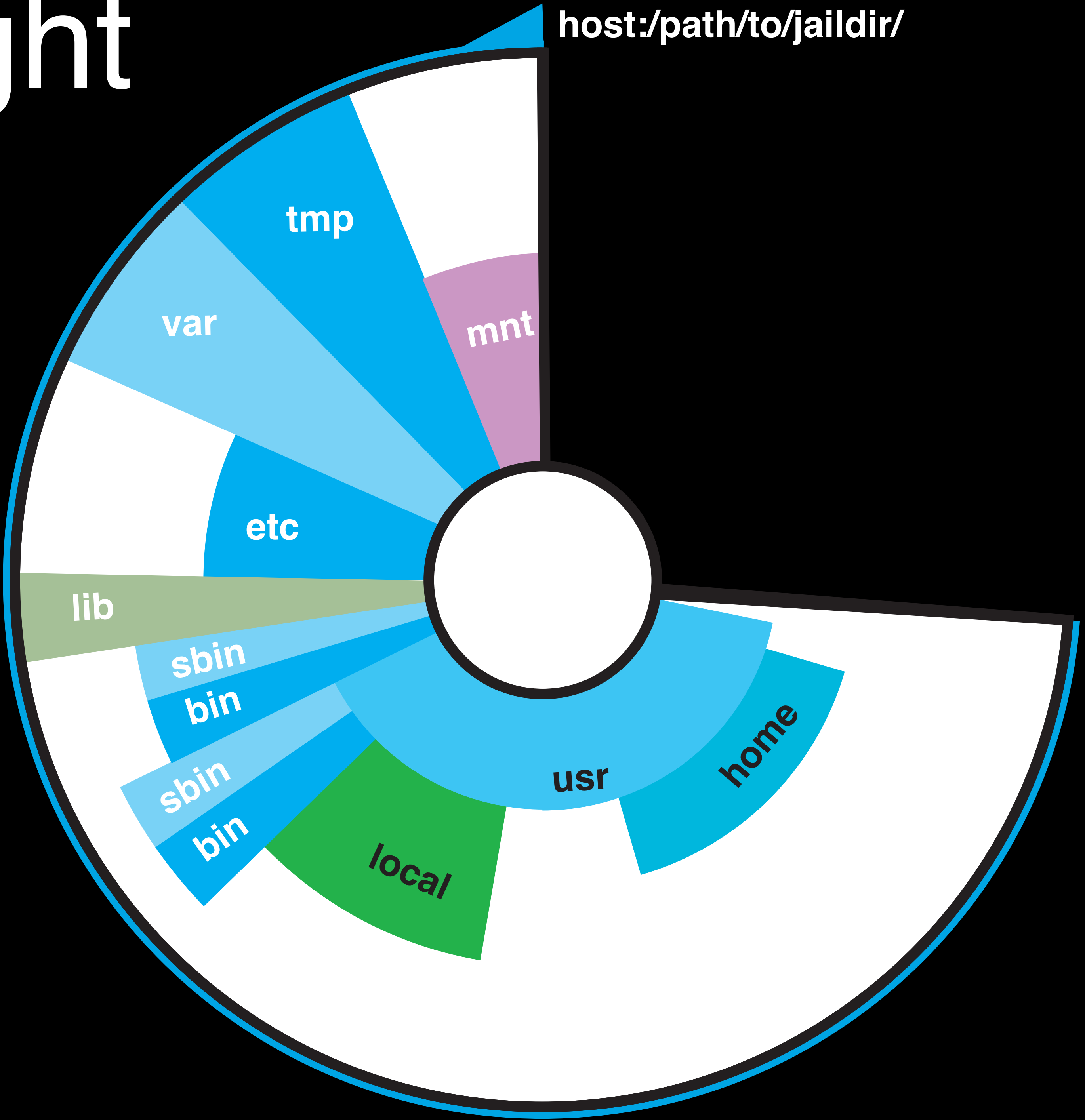
```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```

preflight



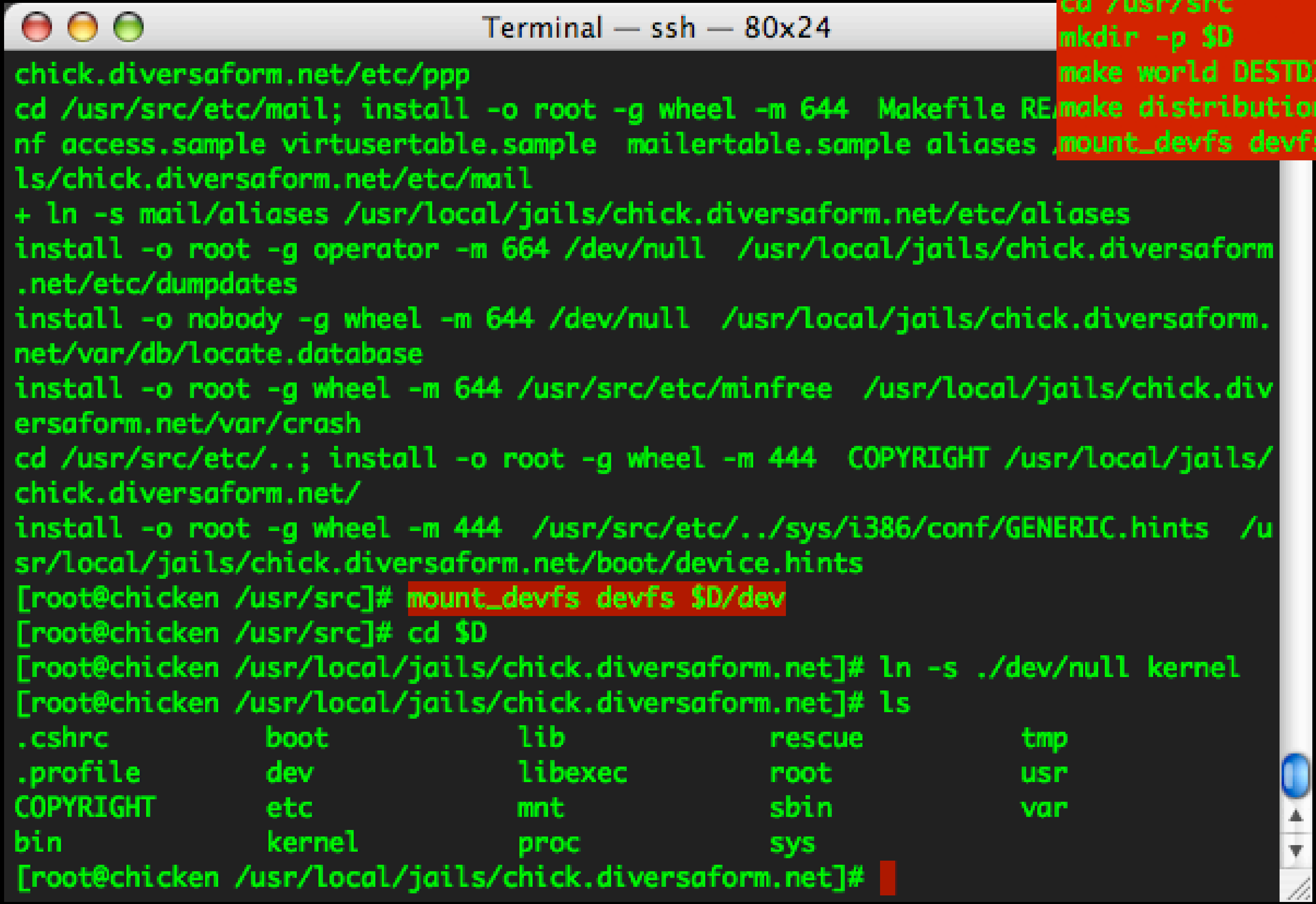
host:/path/to/jaildir/

preflight


host:/path/to/jaildir/
tmp
mnt
var
etc
lib
sbin
bin
sbin
bin
usr
home
local

preflight- (mount /dev)

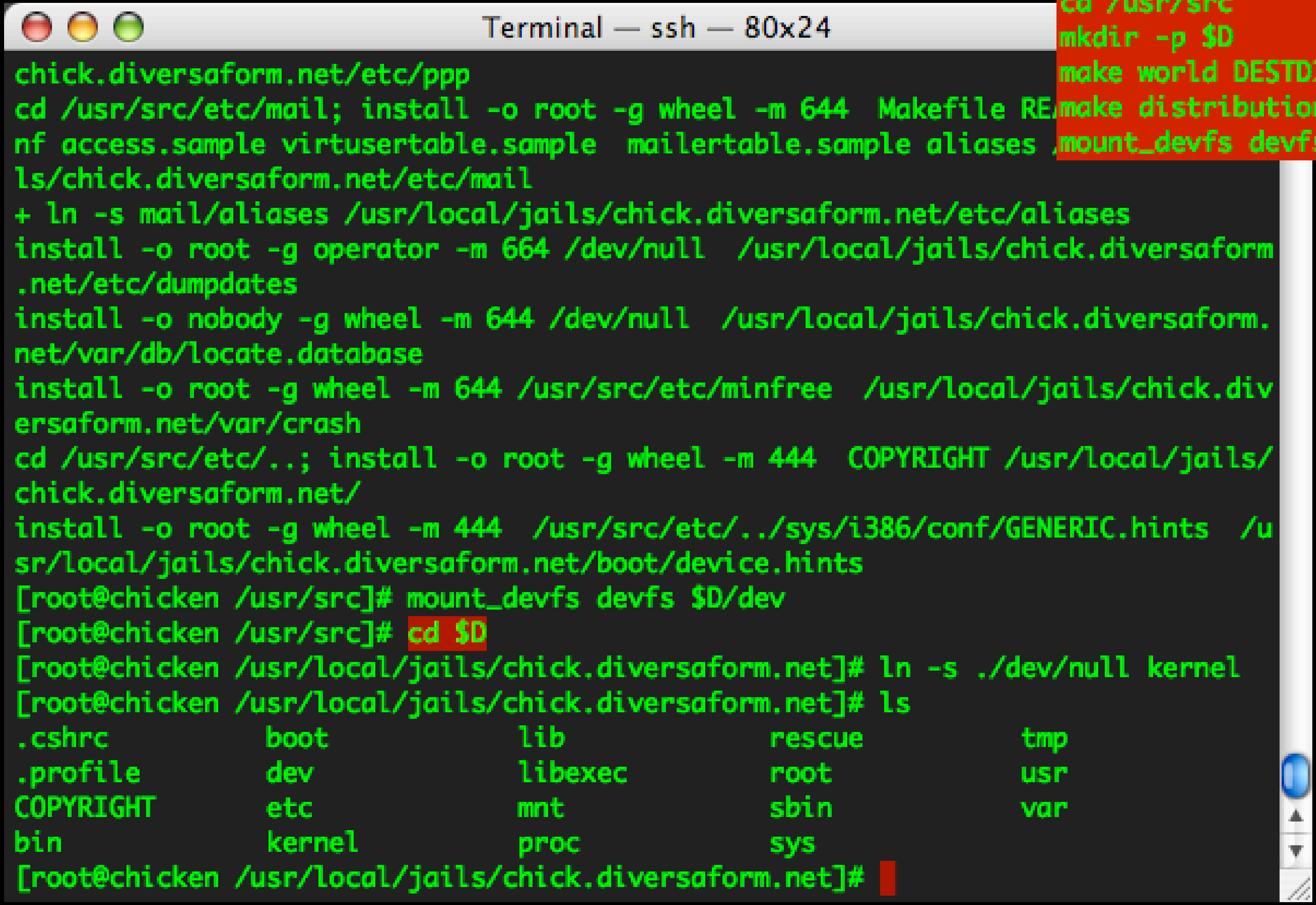
```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```



```
chick.diversaform.net/etc/ppp
cd /usr/src/etc/mail; install -o root -g wheel -m 644  Makefile RE
nf access.sample virtusertable.sample  mailertable.sample aliases .
ls/chick.diversaform.net/etc/mail
+ ln -s mail/aliases /usr/local/jails/chick.diversaform.net/etc/aliases
install -o root -g operator -m 664 /dev/null  /usr/local/jails/chick.diversaform
.net/etc/dumpdates
install -o nobody -g wheel -m 644 /dev/null  /usr/local/jails/chick.diversaform.
net/var/db/locate.database
install -o root -g wheel -m 644 /usr/src/etc/minfree  /usr/local/jails/chick.div
ersaform.net/var/crash
cd /usr/src/etc/..; install -o root -g wheel -m 444  COPYRIGHT /usr/local/jails/
chick.diversaform.net/
install -o root -g wheel -m 444  /usr/src/etc/../sys/i386/conf/GENERIC.hints  /u
sr/local/jails/chick.diversaform.net/boot/device.hints
[root@chicken /usr/src]# mount_devfs devfs $D/dev
[root@chicken /usr/src]# cd $D
[root@chicken /usr/local/jails/chick.diversaform.net]# ln -s ./dev/null kernel
[root@chicken /usr/local/jails/chick.diversaform.net]# ls
.cshrc          boot            lib             rescue          tmp
.profile        dev             libexec         root            usr
COPYRIGHT       etc             mnt             sbin            var
bin             kernel          proc            sys
[root@chicken /usr/local/jails/chick.diversaform.net]# 
```

preflight- (mount /dev)

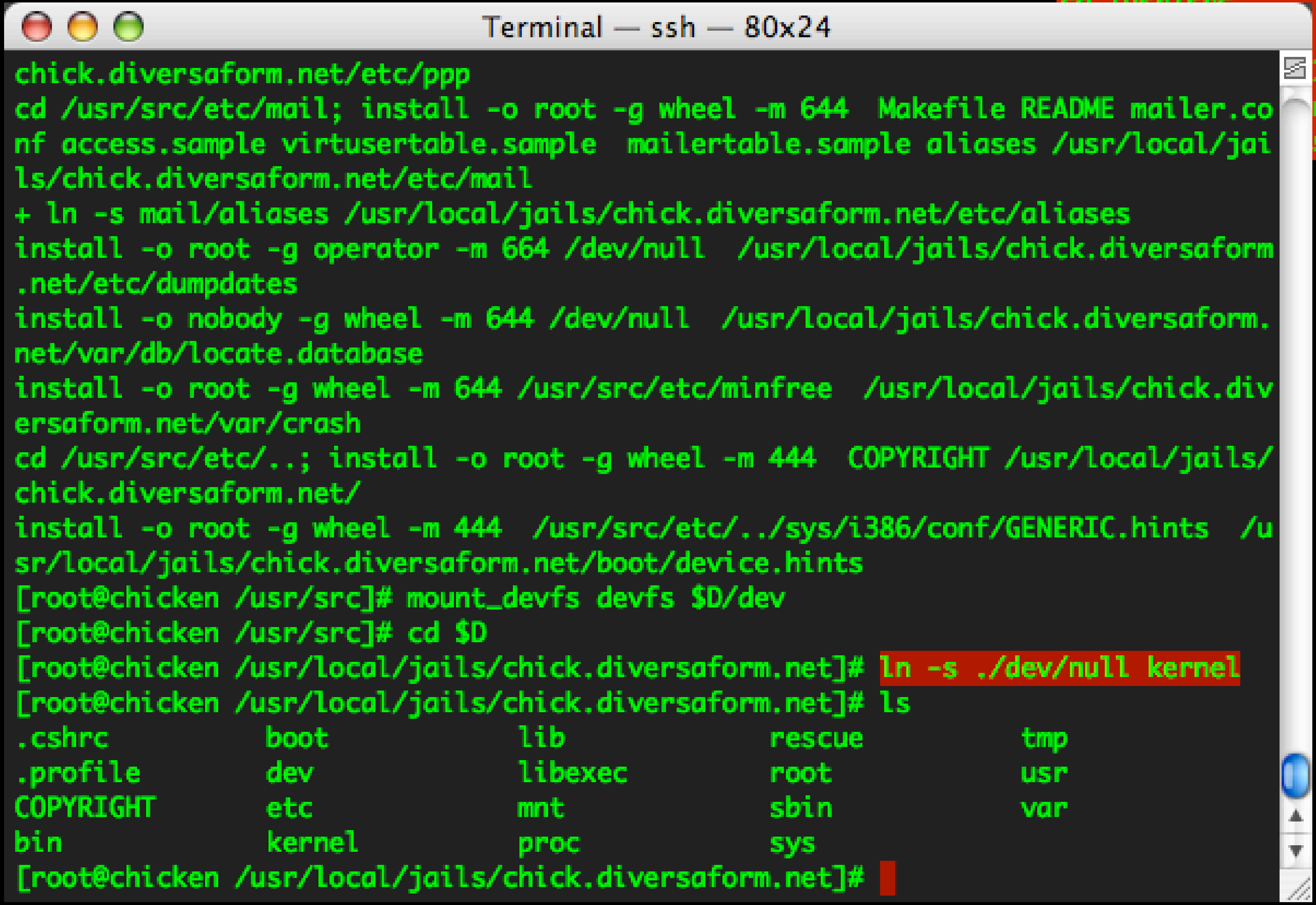
```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```



```
chick.diversaform.net/etc/ppp
cd /usr/src/etc/mail; install -o root -g wheel -m 644  Makefile RE
nf access.sample virtusertable.sample  mailertable.sample aliases .
ls/chick.diversaform.net/etc/mail
+ ln -s mail/aliases /usr/local/jails/chick.diversaform.net/etc/aliases
install -o root -g operator -m 664 /dev/null  /usr/local/jails/chick.diversaform
.net/etc/dumpdates
install -o nobody -g wheel -m 644 /dev/null  /usr/local/jails/chick.diversaform.
net/var/db/locate.database
install -o root -g wheel -m 644 /usr/src/etc/minfree  /usr/local/jails/chick.div
ersaform.net/var/crash
cd /usr/src/etc/..; install -o root -g wheel -m 444  COPYRIGHT /usr/local/jails/
chick.diversaform.net/
install -o root -g wheel -m 444  /usr/src/etc/../sys/i386/conf/GENERIC.hints  /u
sr/local/jails/chick.diversaform.net/boot/device.hints
[root@chicken /usr/src]# mount_devfs devfs $D/dev
[root@chicken /usr/src]# cd $D
[root@chicken /usr/local/jails/chick.diversaform.net]# ln -s ./dev/null kernel
[root@chicken /usr/local/jails/chick.diversaform.net]# ls
.cshrc          boot            lib             rescue          tmp
.profile        dev             libexec         root            usr
COPYRIGHT       etc             mnt             sbin            var
bin             kernel          proc            sys
[root@chicken /usr/local/jails/chick.diversaform.net]# 
```

preflight- (null kernel)

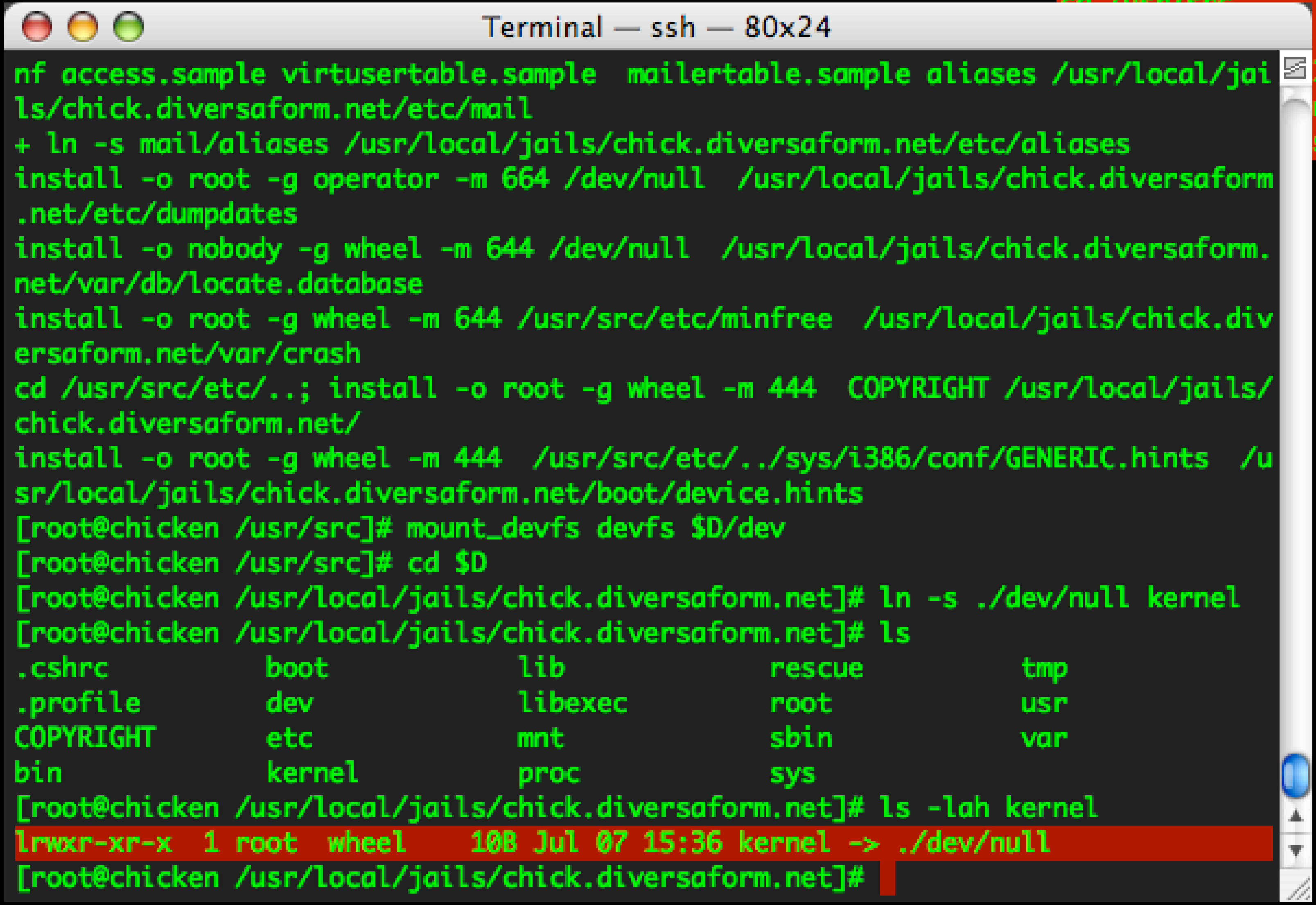
```
D=/here/is/the/jail
cd /usr/src
IR=$D
n DESTDIR=$D
s $D/dev
```



```
chick.diversaform.net/etc/ppp
cd /usr/src/etc/mail; install -o root -g wheel -m 644  Makefile README mailer.co
nf access.sample virtusertable.sample  mailertable.sample aliases /usr/local/jai
ls/chick.diversaform.net/etc/mail
+ ln -s mail/aliases /usr/local/jails/chick.diversaform.net/etc/aliases
install -o root -g operator -m 664 /dev/null  /usr/local/jails/chick.diversaform
.net/etc/dumpdates
install -o nobody -g wheel -m 644 /dev/null  /usr/local/jails/chick.diversaform.
net/var/db/locate.database
install -o root -g wheel -m 644 /usr/src/etc/minfree  /usr/local/jails/chick.div
ersaform.net/var/crash
cd /usr/src/etc/..; install -o root -g wheel -m 444  COPYRIGHT /usr/local/jails/
chick.diversaform.net/
install -o root -g wheel -m 444  /usr/src/etc/../sys/i386/conf/GENERIC.hints  /u
sr/local/jails/chick.diversaform.net/boot/device.hints
[root@chicken /usr/src]# mount_devfs devfs $D/dev
[root@chicken /usr/src]# cd $D
[root@chicken /usr/local/jails/chick.diversaform.net]# ln -s ./dev/null kernel
[root@chicken /usr/local/jails/chick.diversaform.net]# ls
.cshrc          boot            lib             rescue          tmp
.profile        dev             libexec         root            usr
COPYRIGHT       etc             mnt             sbin            var
bin             kernel          proc            sys
[root@chicken /usr/local/jails/chick.diversaform.net]# 
```

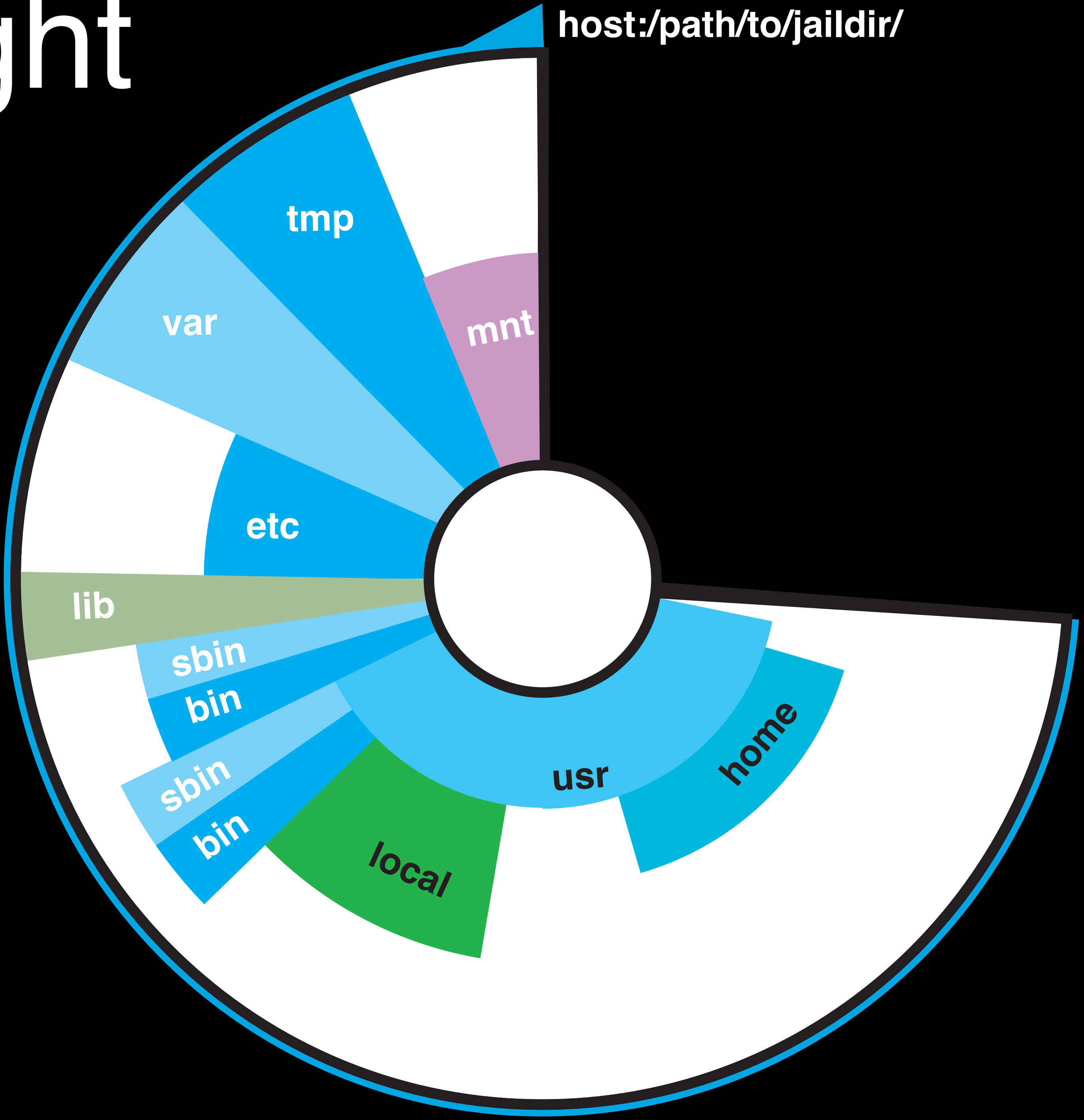
preflight- (null kernel)

```
D=/here/is/the/jail
cd /usr/src
IR=$D
n DESTDIR=$D
s $D/dev
```

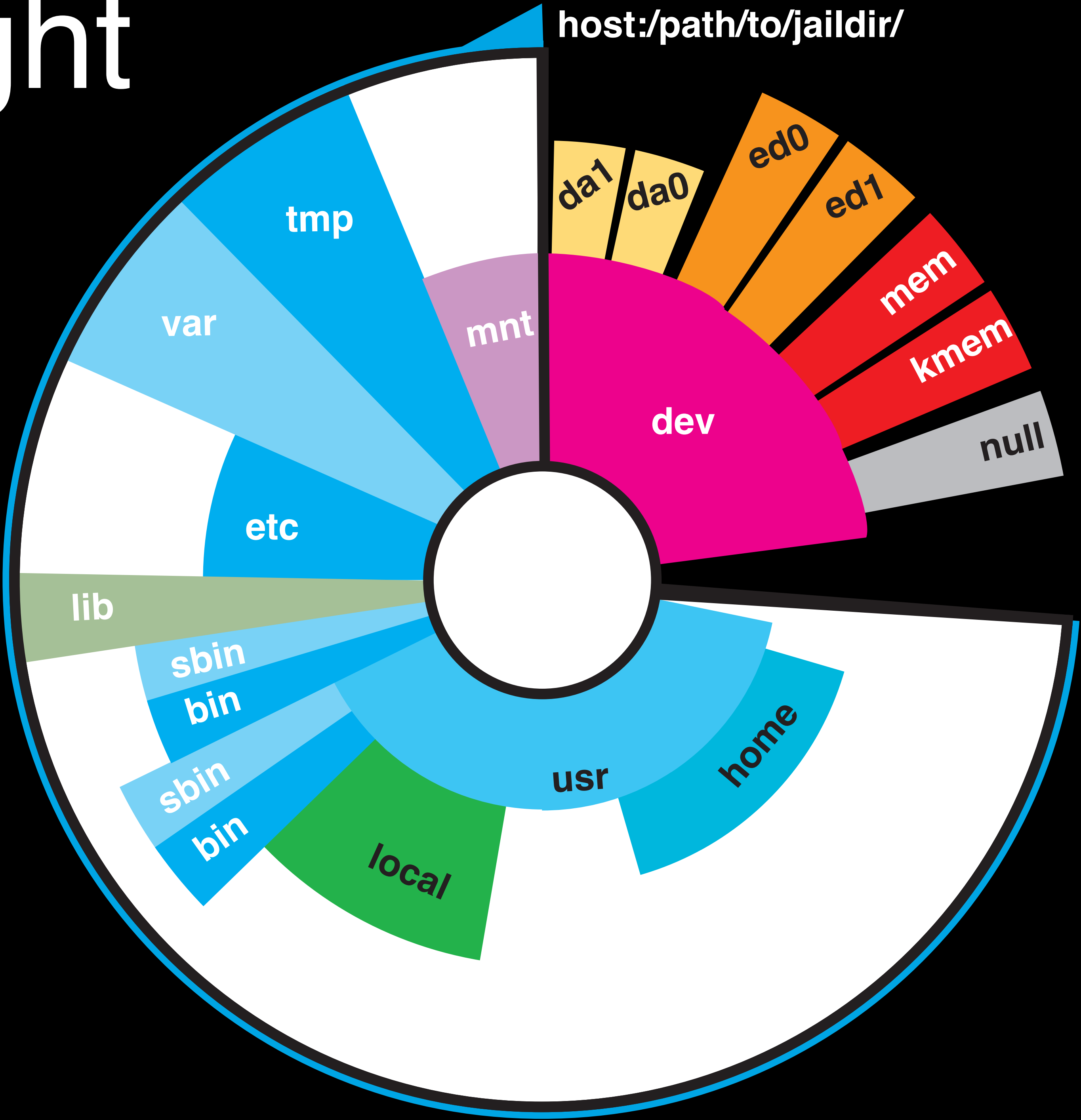


```
nf access.sample virtusertable.sample  mailertable.sample aliases /usr/local/jai
ls/chick.diversaform.net/etc/mail
+ ln -s mail/aliases /usr/local/jails/chick.diversaform.net/etc/aliases
install -o root -g operator -m 664 /dev/null  /usr/local/jails/chick.diversaform
.net/etc/dumpdates
install -o nobody -g wheel -m 644 /dev/null  /usr/local/jails/chick.diversaform.
net/var/db/locate.database
install -o root -g wheel -m 644 /usr/src/etc/minfree  /usr/local/jails/chick.div
ersaform.net/var/crash
cd /usr/src/etc/..; install -o root -g wheel -m 444  COPYRIGHT /usr/local/jails/
chick.diversaform.net/
install -o root -g wheel -m 444  /usr/src/etc/../sys/i386/conf/GENERIC.hints  /u
sr/local/jails/chick.diversaform.net/boot/device.hints
[root@chicken /usr/src]# mount_devfs devfs $D/dev
[root@chicken /usr/src]# cd $D
[root@chicken /usr/local/jails/chick.diversaform.net]# ln -s ./dev/null kernel
[root@chicken /usr/local/jails/chick.diversaform.net]# ls
.cshrc          boot            lib             rescue          tmp
.profile        dev             libexec         root            usr
COPYRIGHT       etc             mnt             sbin            var
bin             kernel          proc            sys
[root@chicken /usr/local/jails/chick.diversaform.net]# ls -lah kernel
lrwxr-xr-x  1 root  wheel    10B Jul 07 15:36 kernel -> ./dev/null
[root@chicken /usr/local/jails/chick.diversaform.net]#
```

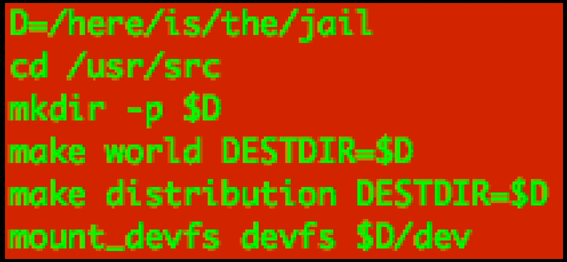
preflight


host:/path/to/jaildir/
tmp
mnt
var
etc
lib
sbin
bin
sbin
bin
usr
home
local

preflight


host:/path/to/jaildir/
tmp
var
mnt
etc
lib
sbin
bin
sbin
bin
local
usr
home
dev
da1
da0
ed0
ed1
mem
kmem
null

preflight



```
D=/here/is/the/jail
cd /usr/src
mkdir -p $D
make world DESTDIR=$D
make distribution DESTDIR=$D
mount_devfs devfs $D/dev
```

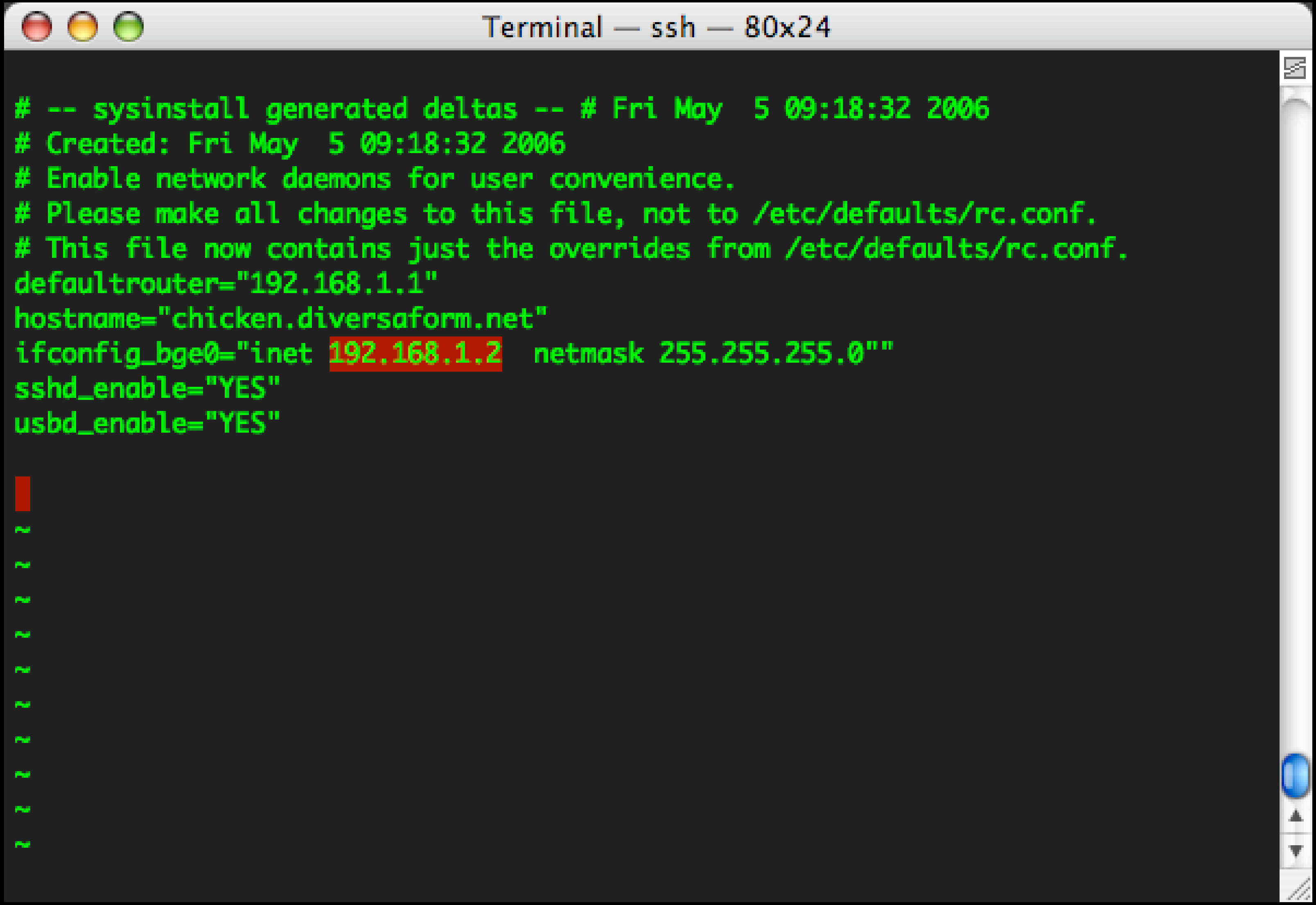
Common Question:

Why isn’t there an automated build system for this stage?

- Take care with the build procedure, it’s better to automate things later, once you have basics setup.

(network, users, packages, time, etc.)

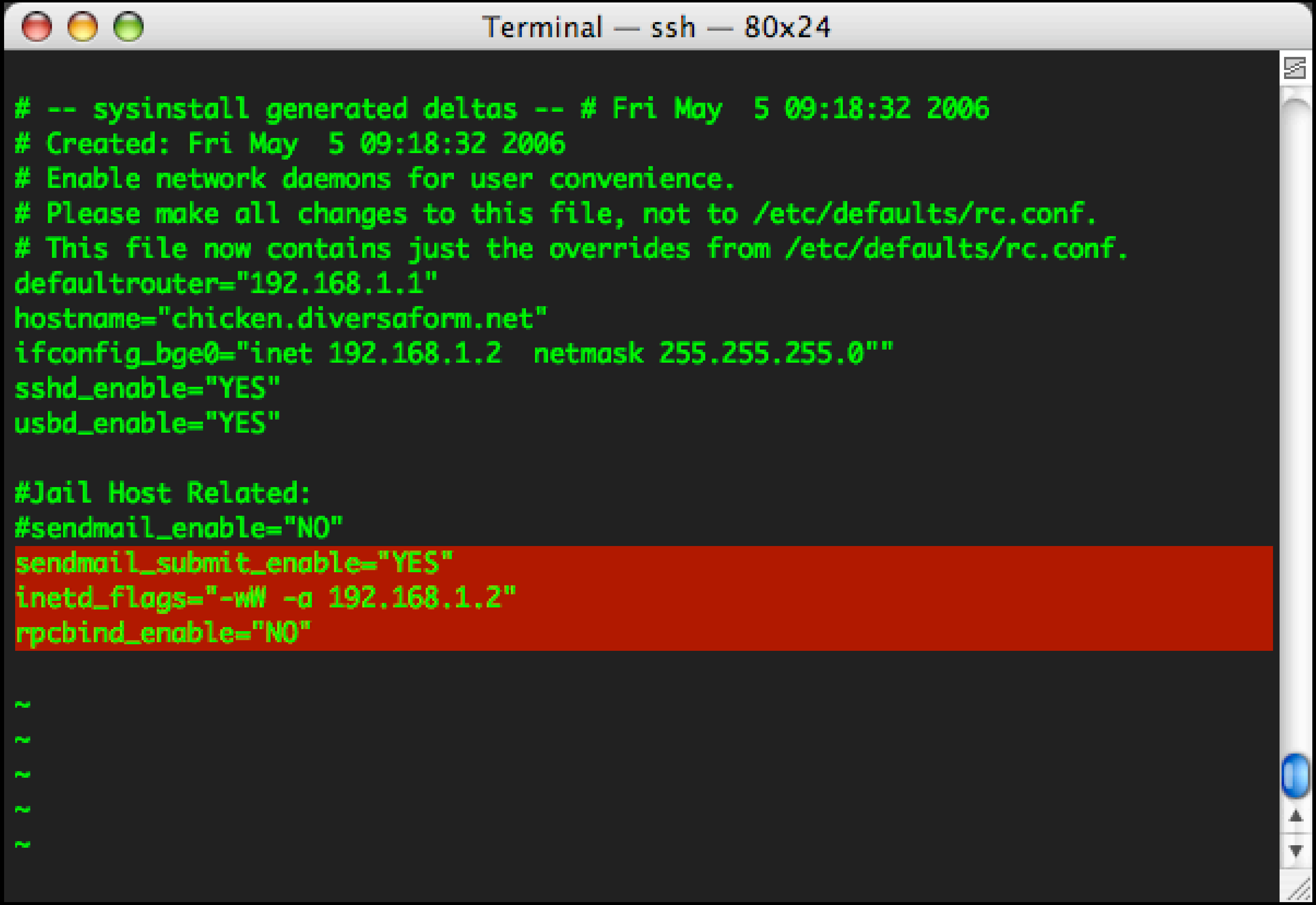
preflight- (config host)



```
# -- sysinstall generated deltas -- # Fri May  5 09:18:32 2006
# Created: Fri May  5 09:18:32 2006
# Enable network daemons for user convenience.
# Please make all changes to this file, not to /etc/defaults/rc.conf.
# This file now contains just the overrides from /etc/defaults/rc.conf.
defaultrouter="192.168.1.1"
hostname="chicken.diversaform.net"
ifconfig_bge0="inet 192.168.1.2  netmask 255.255.255.0""
sshd_enable="YES"
usbd_enable="YES"

~
~
~
~
~
~
~
~
~
~
```

jailinghost:/etc/rc.conf (stock)

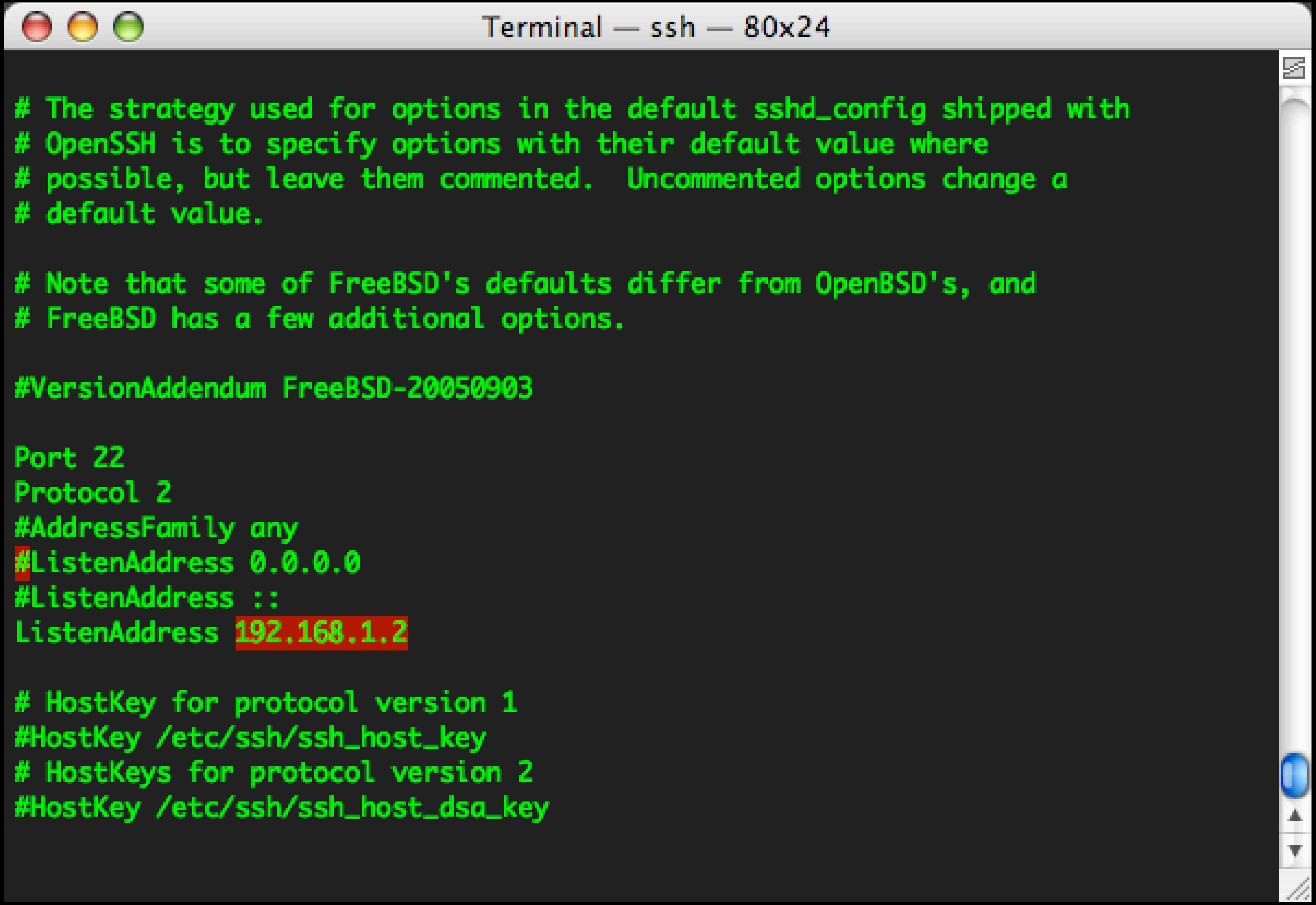
preflight- (config host)



```
# -- sysinstall generated deltas -- # Fri May  5 09:18:32 2006
# Created: Fri May  5 09:18:32 2006
# Enable network daemons for user convenience.
# Please make all changes to this file, not to /etc/defaults/rc.conf.
# This file now contains just the overrides from /etc/defaults/rc.conf.
defaultrouter="192.168.1.1"
hostname="chicken.diversaform.net"
ifconfig_bge0="inet 192.168.1.2  netmask 255.255.255.0""
sshd_enable="YES"
usbd_enable="YES"

#Jail Host Related:
#sendmail_enable="NO"
sendmail_submit_enable="YES"
inetd_flags="-wW -a 192.168.1.2"
rpcbind_enable="NO"

~
~
~
~
~
```

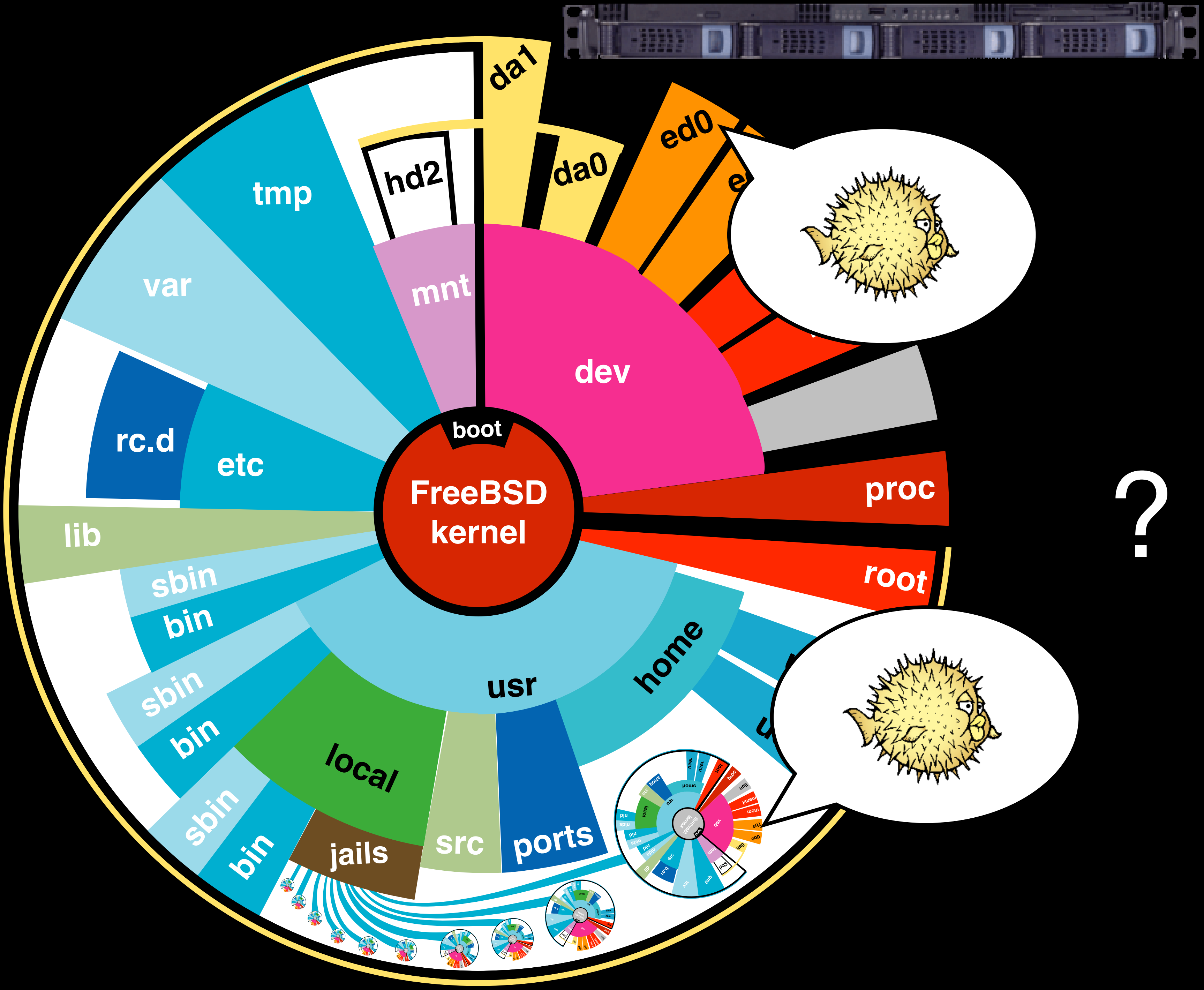
jailinghost:/etc/rc.conf

preflight- (master system)



```
# The strategy used for options in the default sshd_config shipped with
# OpenSSH is to specify options with their default value where
# possible, but leave them commented.  Uncommented options change a
# default value.

# Note that some of FreeBSD's defaults differ from OpenBSD's, and
# FreeBSD has a few additional options.

#VersionAddendum FreeBSD-20050903

Port 22
Protocol 2
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::
ListenAddress 192.168.1.2

# HostKey for protocol version 1
#HostKey /etc/ssh/ssh_host_key
# HostKeys for protocol version 2
#HostKey /etc/ssh/ssh_host_dsa_key
```

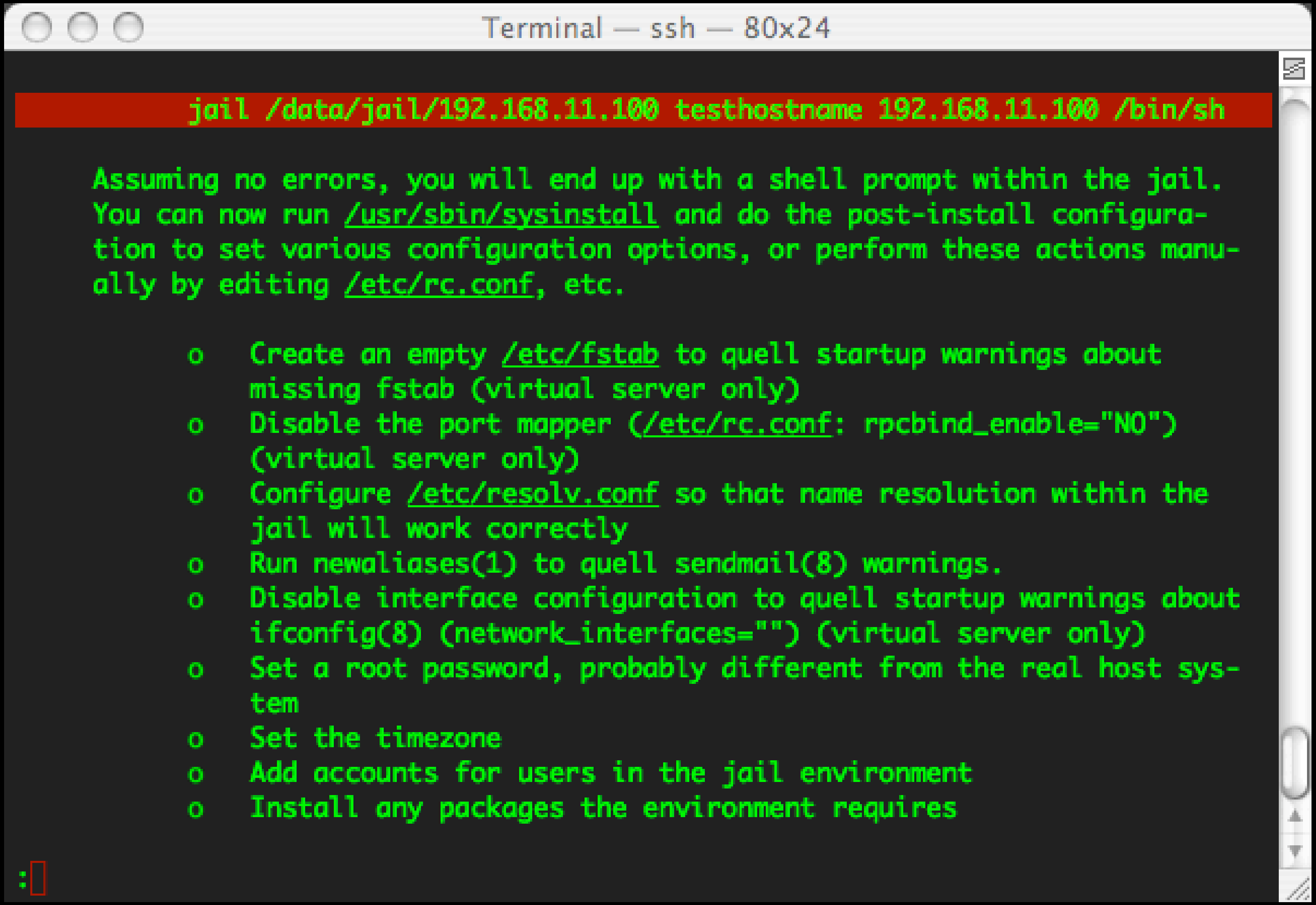
jailinghost:/etc/ssh/sshd_conf


da1
hd2
da0
ed0
tmp
var
mnt
dev
rc.d
etc
boot
FreeBSD kernel
proc
lib
root
sbin
bin
sbin
bin
sbin
bin
usr
home
local
jails
src
ports

?

configure - call jailed sh

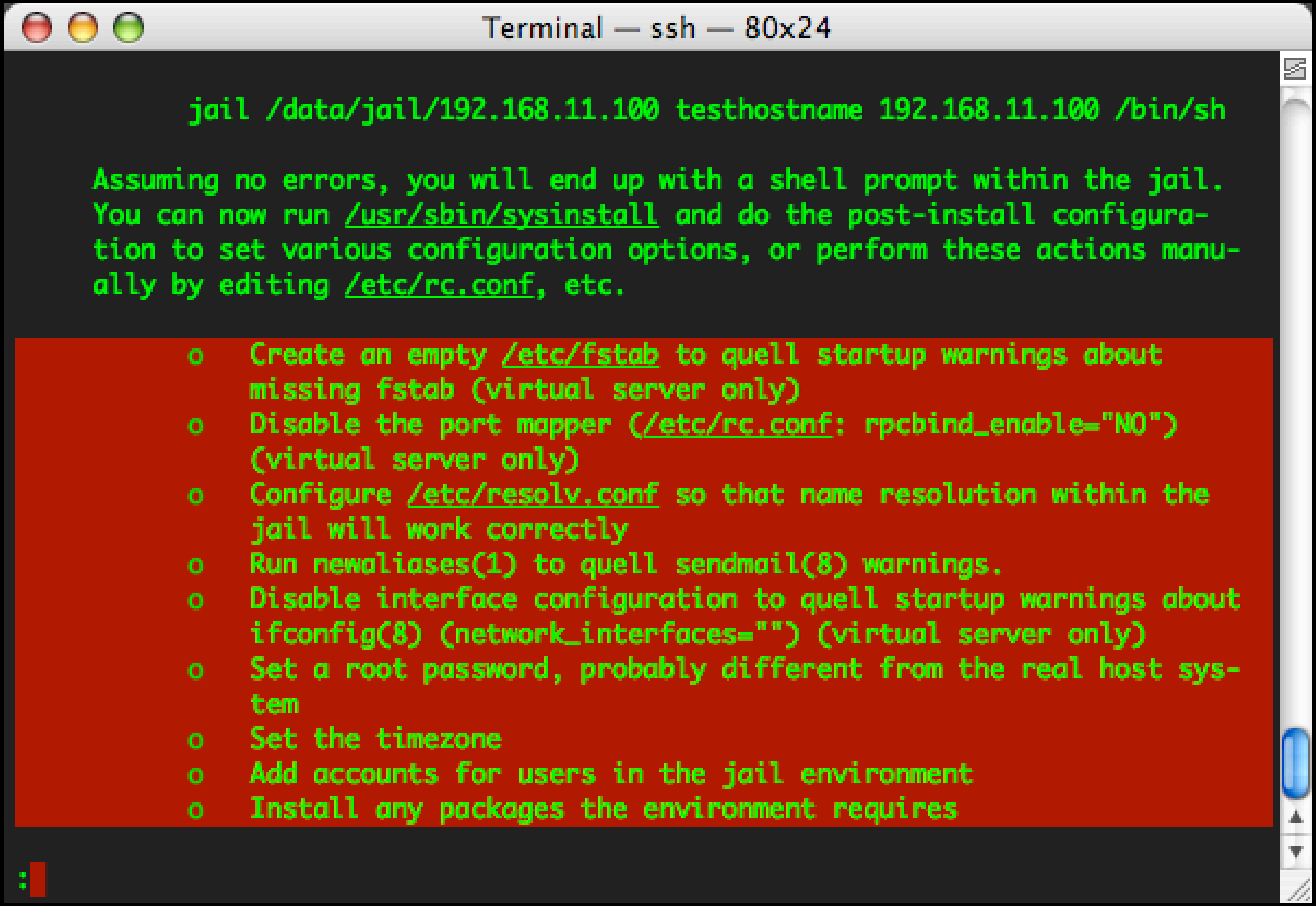
(analagous to booting a machine in su mode)



```
           jail /data/jail/192.168.11.100 testhostname 192.168.11.100 /bin/sh

     Assuming no errors, you will end up with a shell prompt within the jail.
     You can now run /usr/sbin/sysinstall and do the post-install configura-
     tion to set various configuration options, or perform these actions manu-
     ally by editing /etc/rc.conf, etc.

           o   Create an empty /etc/fstab to quell startup warnings about
               missing fstab (virtual server only)
           o   Disable the port mapper (/etc/rc.conf: rpcbind_enable="NO")
               (virtual server only)
           o   Configure /etc/resolv.conf so that name resolution within the
               jail will work correctly
           o   Run newaliases(1) to quell sendmail(8) warnings.
           o   Disable interface configuration to quell startup warnings about
               ifconfig(8) (network_interfaces="") (virtual server only)
           o   Set a root password, probably different from the real host sys-
               tem
           o   Set the timezone
           o   Add accounts for users in the jail environment
           o   Install any packages the environment requires

:
```

configure - call jailed sh

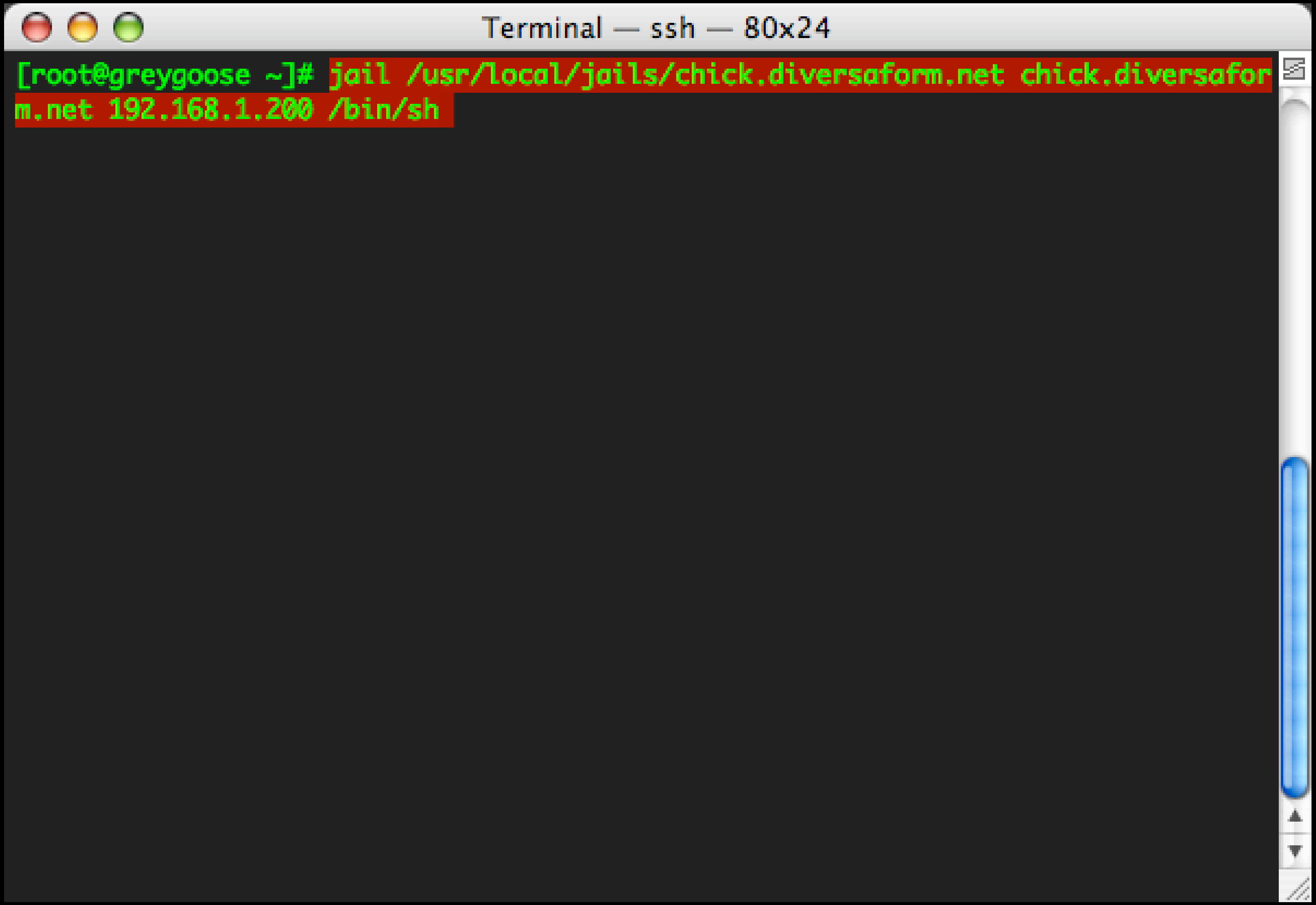
(analagous to booting a machine in su mode)



```
           jail /data/jail/192.168.11.100 testhostname 192.168.11.100 /bin/sh

     Assuming no errors, you will end up with a shell prompt within the jail.
     You can now run /usr/sbin/sysinstall and do the post-install configura-
     tion to set various configuration options, or perform these actions manu-
     ally by editing /etc/rc.conf, etc.

           o   Create an empty /etc/fstab to quell startup warnings about
               missing fstab (virtual server only)
           o   Disable the port mapper (/etc/rc.conf: rpcbind_enable="NO")
               (virtual server only)
           o   Configure /etc/resolv.conf so that name resolution within the
               jail will work correctly
           o   Run newaliases(1) to quell sendmail(8) warnings.
           o   Disable interface configuration to quell startup warnings about
               ifconfig(8) (network_interfaces="") (virtual server only)
           o   Set a root password, probably different from the real host sys-
               tem
           o   Set the timezone
           o   Add accounts for users in the jail environment
           o   Install any packages the environment requires

:
```

configure - call jailed sh

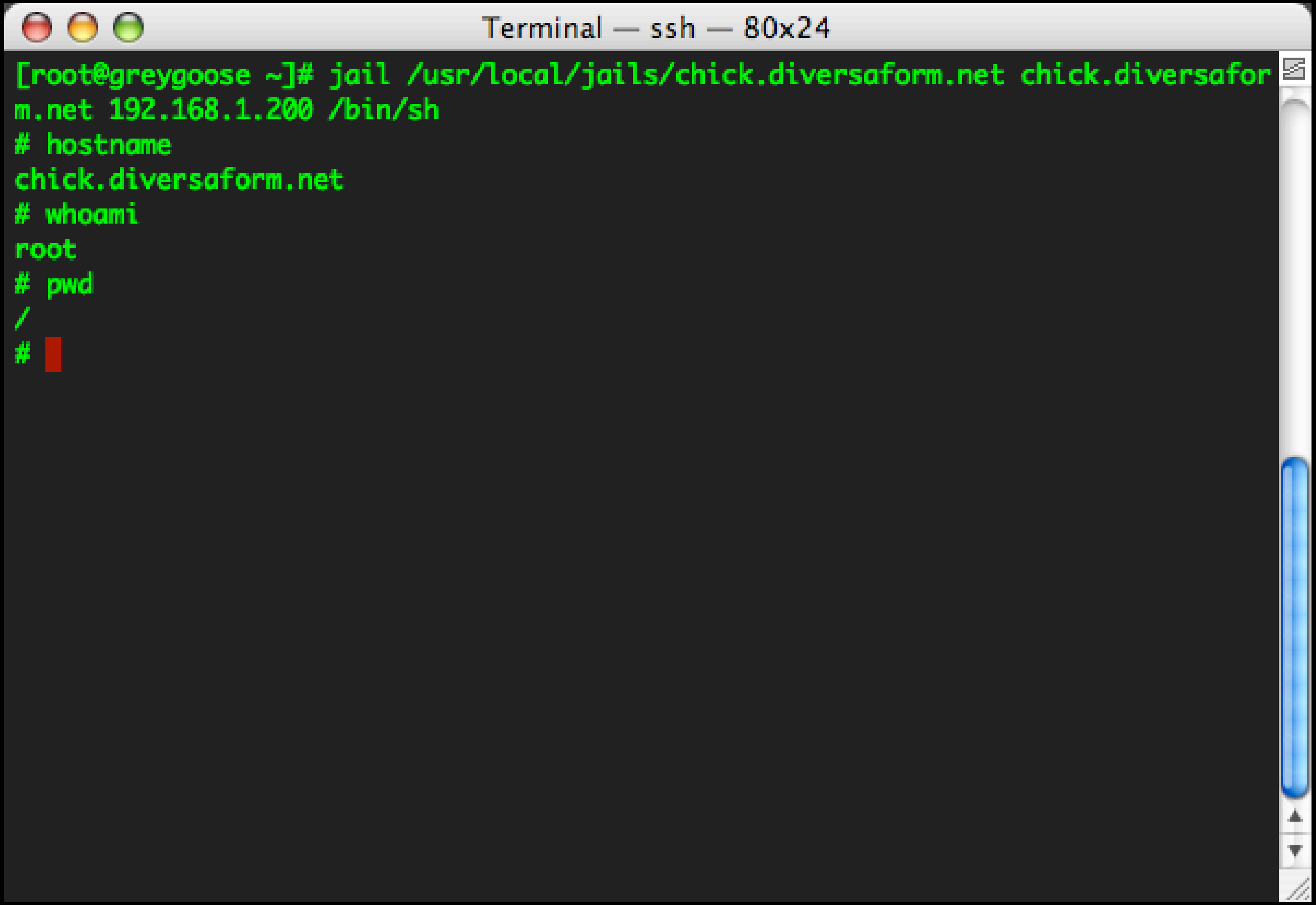
(analagous to booting a machine in su mode)



```
[root@greygoose ~]# jail /usr/local/jails/chick.diversaform.net chick.diversafor
m.net 192.168.1.200 /bin/sh
```

configure - call jailed sh

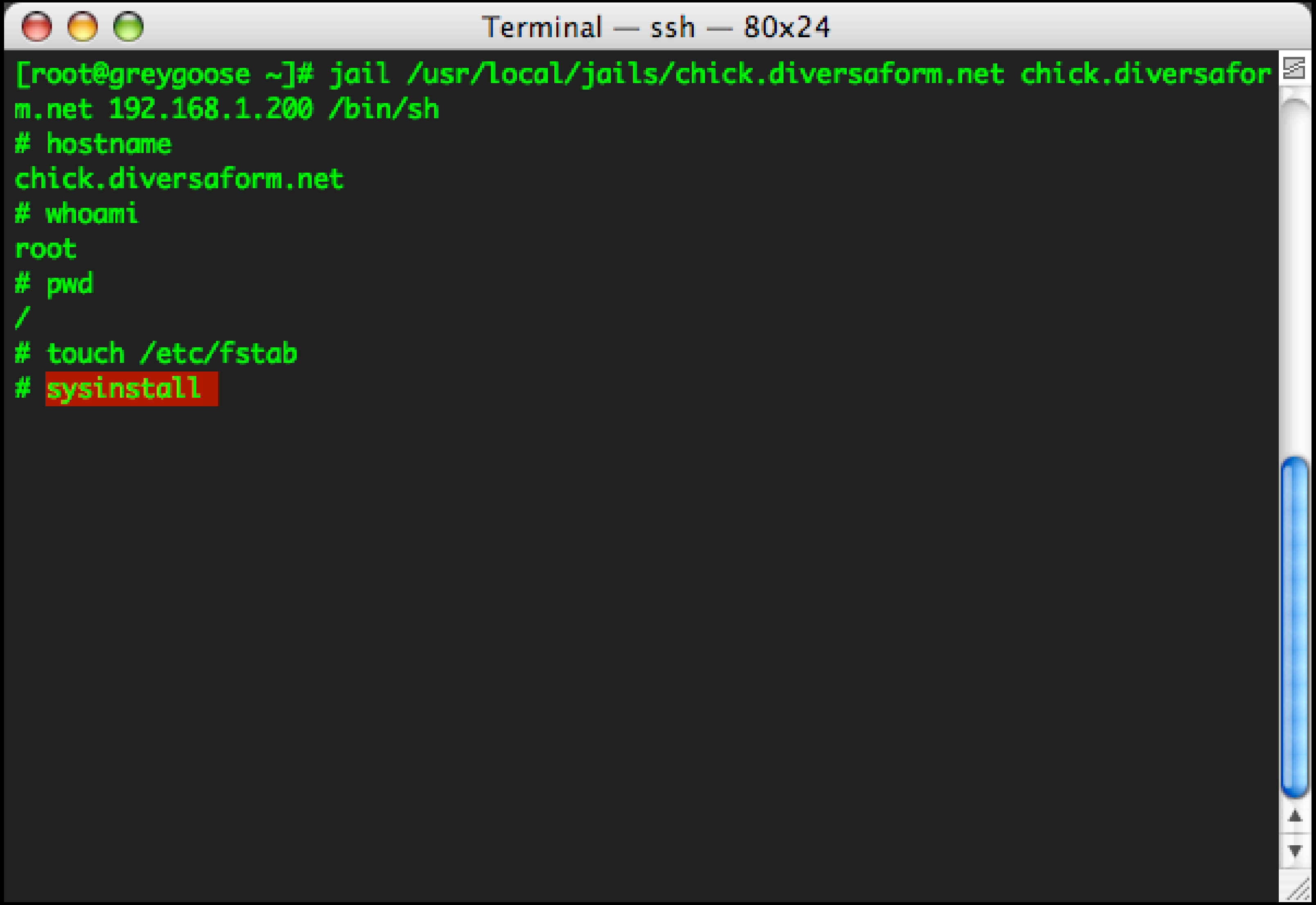
configure the jail, **inside the jail**



```
[root@greygoose ~]# jail /usr/local/jails/chick.diversaform.net chick.diversafor
m.net 192.168.1.200 /bin/sh
# hostname
chick.diversaform.net
# whoami
root
# pwd
/
# 
```

configure - call jailed sh

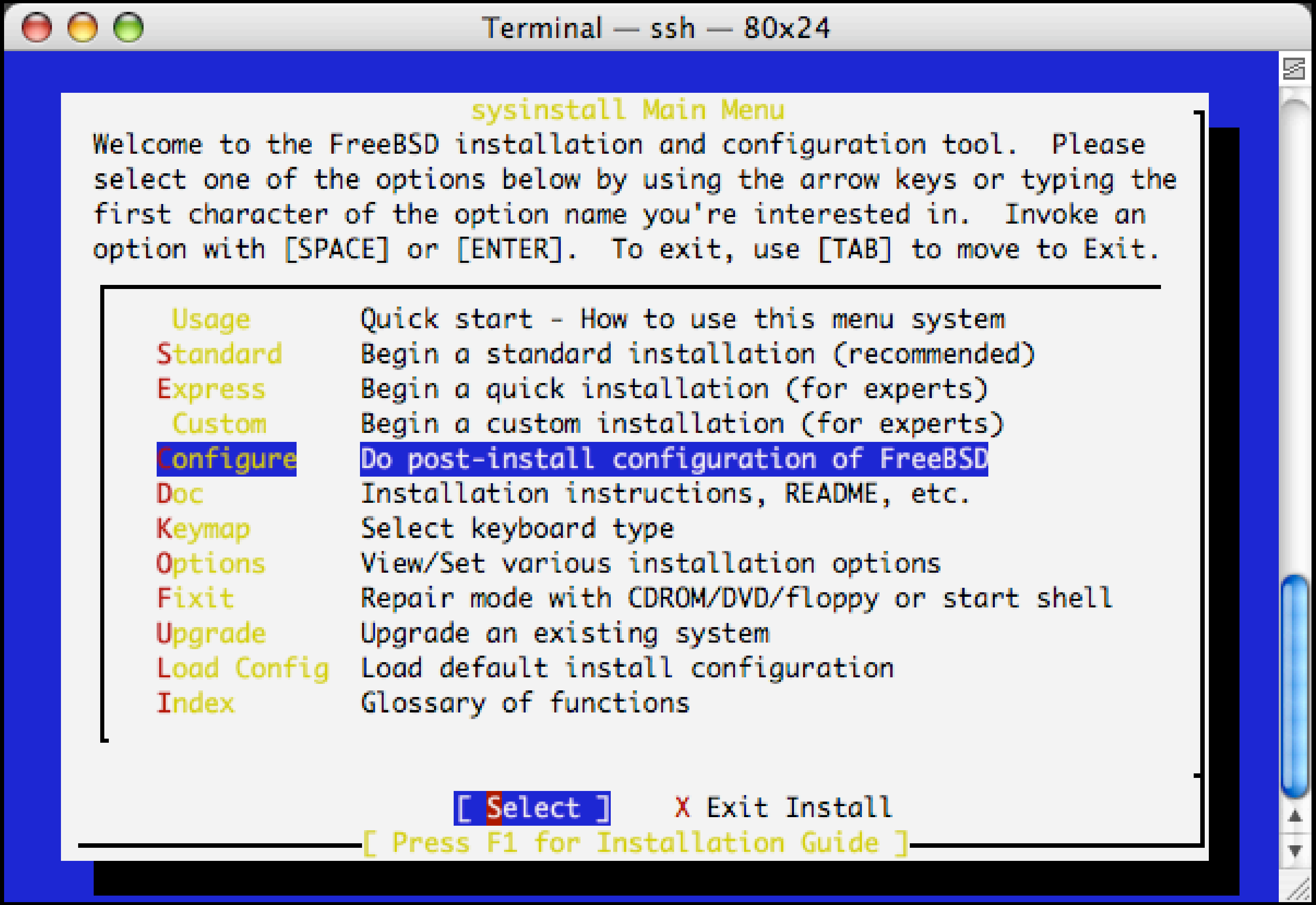
configure the jail, **inside the jail**



```
[root@greygoose ~]# jail /usr/local/jails/chick.diversaform.net chick.diversafor
m.net 192.168.1.200 /bin/sh
# hostname
chick.diversaform.net
# whoami
root
# pwd
/
# touch /etc/fstab
# sysinstall
```

configure - call jailed sh

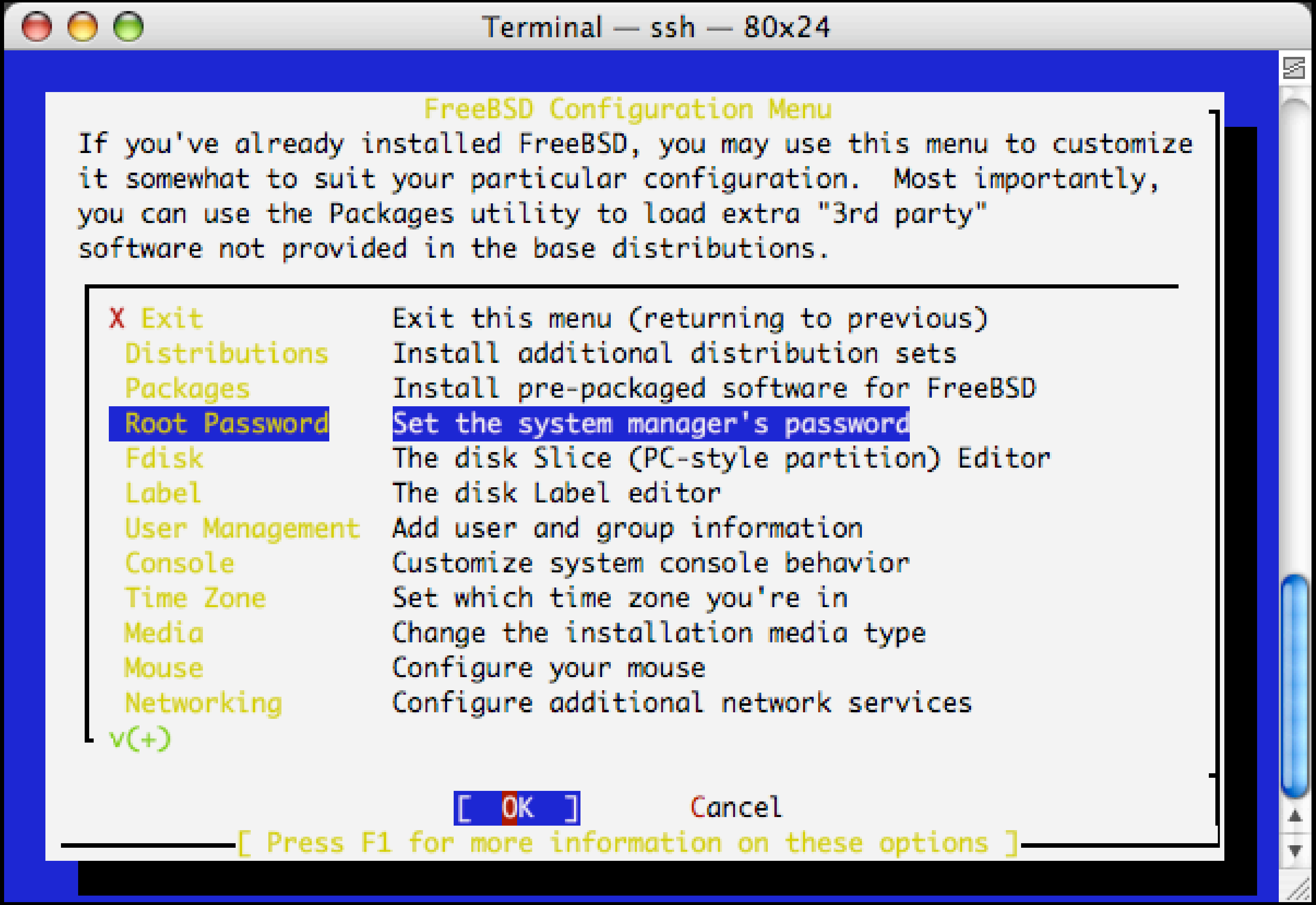
sysctl, whee!



```
                          sysinstall Main Menu
 Welcome to the FreeBSD installation and configuration tool.  Please
 select one of the options below by using the arrow keys or typing the
 first character of the option name you're interested in.  Invoke an
 option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

      Usage        Quick start - How to use this menu system
     Standard      Begin a standard installation (recommended)
     Express       Begin a quick installation (for experts)
      Custom       Begin a custom installation (for experts)
     Configure     Do post-install configuration of FreeBSD
     Doc           Installation instructions, README, etc.
     Keymap        Select keyboard type
     Options       View/Set various installation options
     Fixit         Repair mode with CDROM/DVD/floppy or start shell
     Upgrade       Upgrade an existing system
     Load Config   Load default install configuration
     Index         Glossary of functions

                     [ Select ]     X Exit Install
                  [ Press F1 for Installation Guide ]
```

configure - call jailed sh

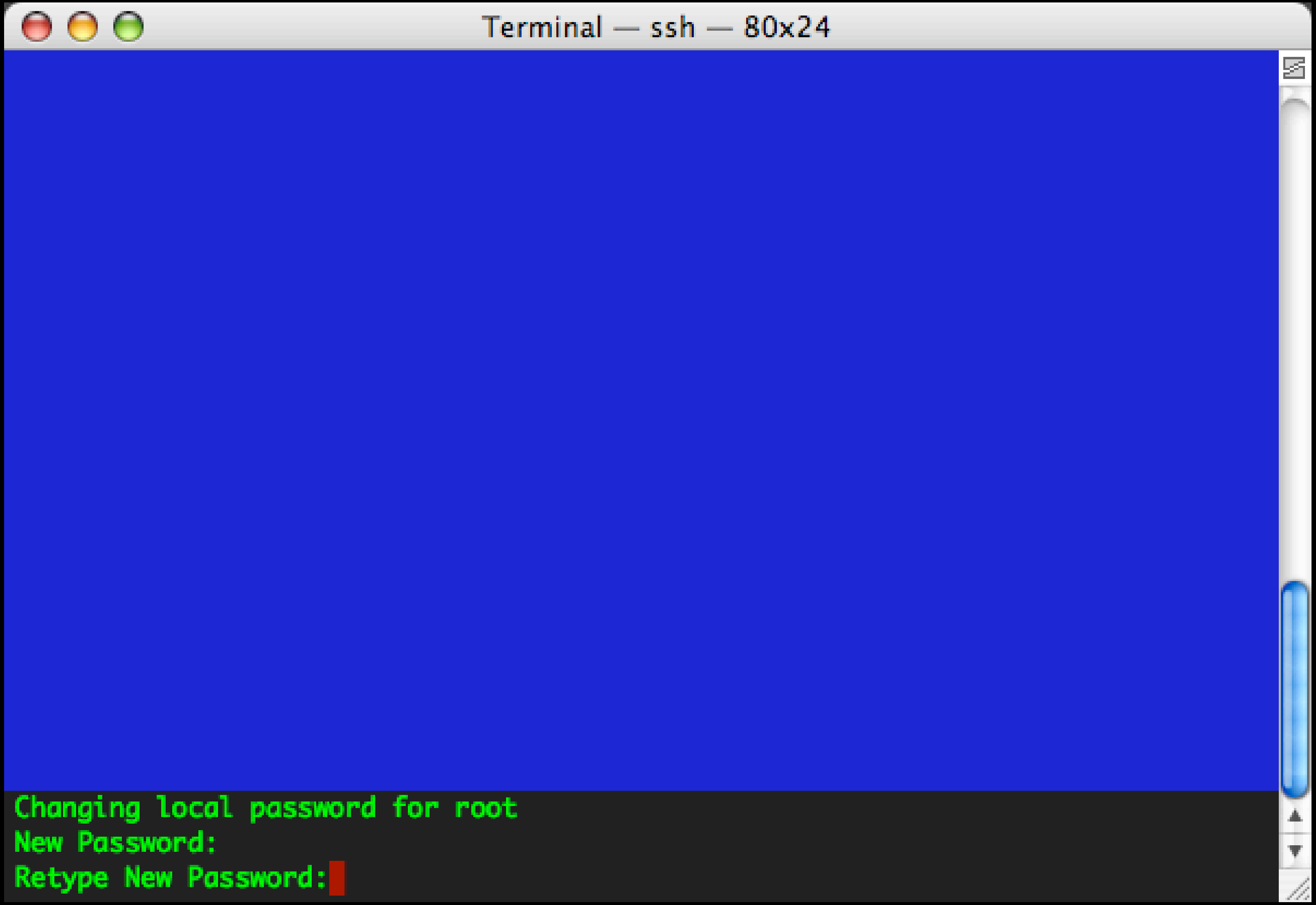
root pw



```
                        FreeBSD Configuration Menu
 If you've already installed FreeBSD, you may use this menu to customize
 it somewhat to suit your particular configuration.  Most importantly,
 you can use the Packages utility to load extra "3rd party"
 software not provided in the base distributions.

   X Exit              Exit this menu (returning to previous)
     Distributions     Install additional distribution sets
     Packages          Install pre-packaged software for FreeBSD
     Root Password     Set the system manager's password
     Fdisk             The disk Slice (PC-style partition) Editor
     Label             The disk Label editor
     User Management   Add user and group information
     Console           Customize system console behavior
     Time Zone         Set which time zone you're in
     Media             Change the installation media type
     Mouse             Configure your mouse
     Networking        Configure additional network services
   v(+)

                     [  OK  ]        Cancel
           [ Press F1 for more information on these options ]
```

configure - call jailed sh

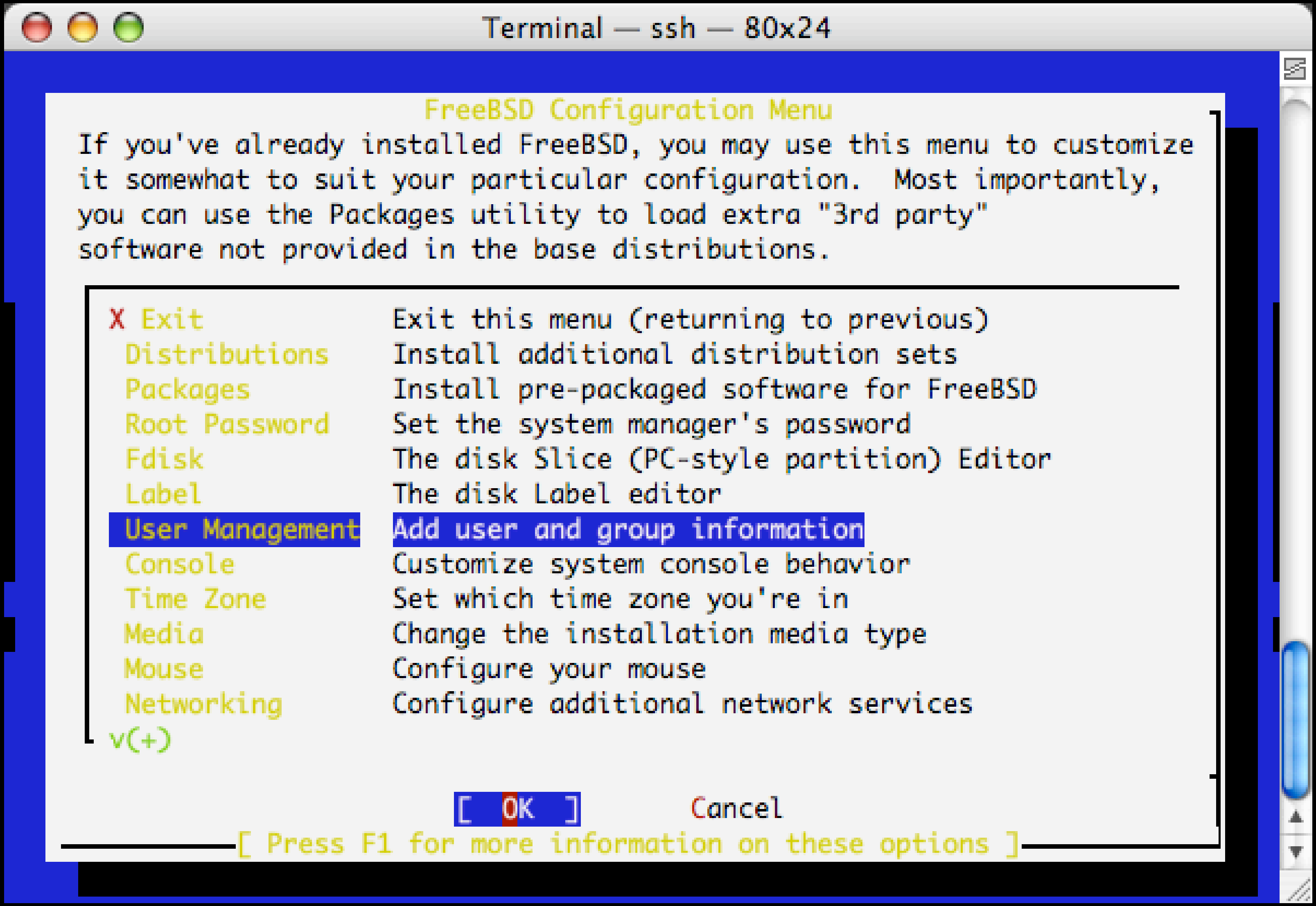
root pw



```
Changing local password for root
New Password:
Retype New Password:
```

configure - call jailed sh

add users



```
                        FreeBSD Configuration Menu
 If you've already installed FreeBSD, you may use this menu to customize
 it somewhat to suit your particular configuration.  Most importantly,
 you can use the Packages utility to load extra "3rd party"
 software not provided in the base distributions.

  X Exit              Exit this menu (returning to previous)
    Distributions     Install additional distribution sets
    Packages          Install pre-packaged software for FreeBSD
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    Fdisk             The disk Slice (PC-style partition) Editor
    Label             The disk Label editor
    User Management   Add user and group information
    Console           Customize system console behavior
    Time Zone         Set which time zone you're in
    Media             Change the installation media type
    Mouse             Configure your mouse
    Networking        Configure additional network services
  v(+)

                   [  OK  ]         Cancel
          [ Press F1 for more information on these options ]
```
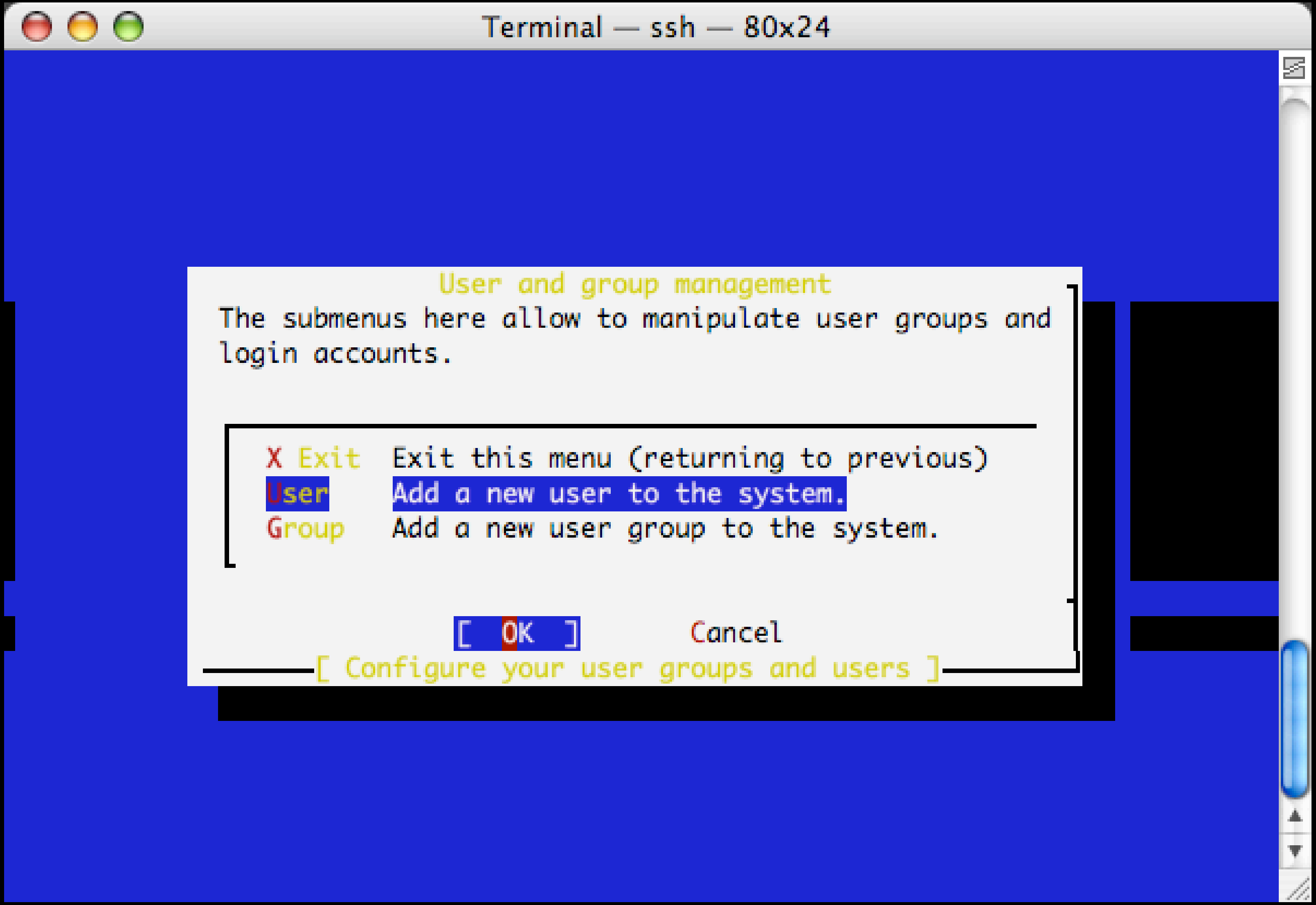

configure - call jailed sh

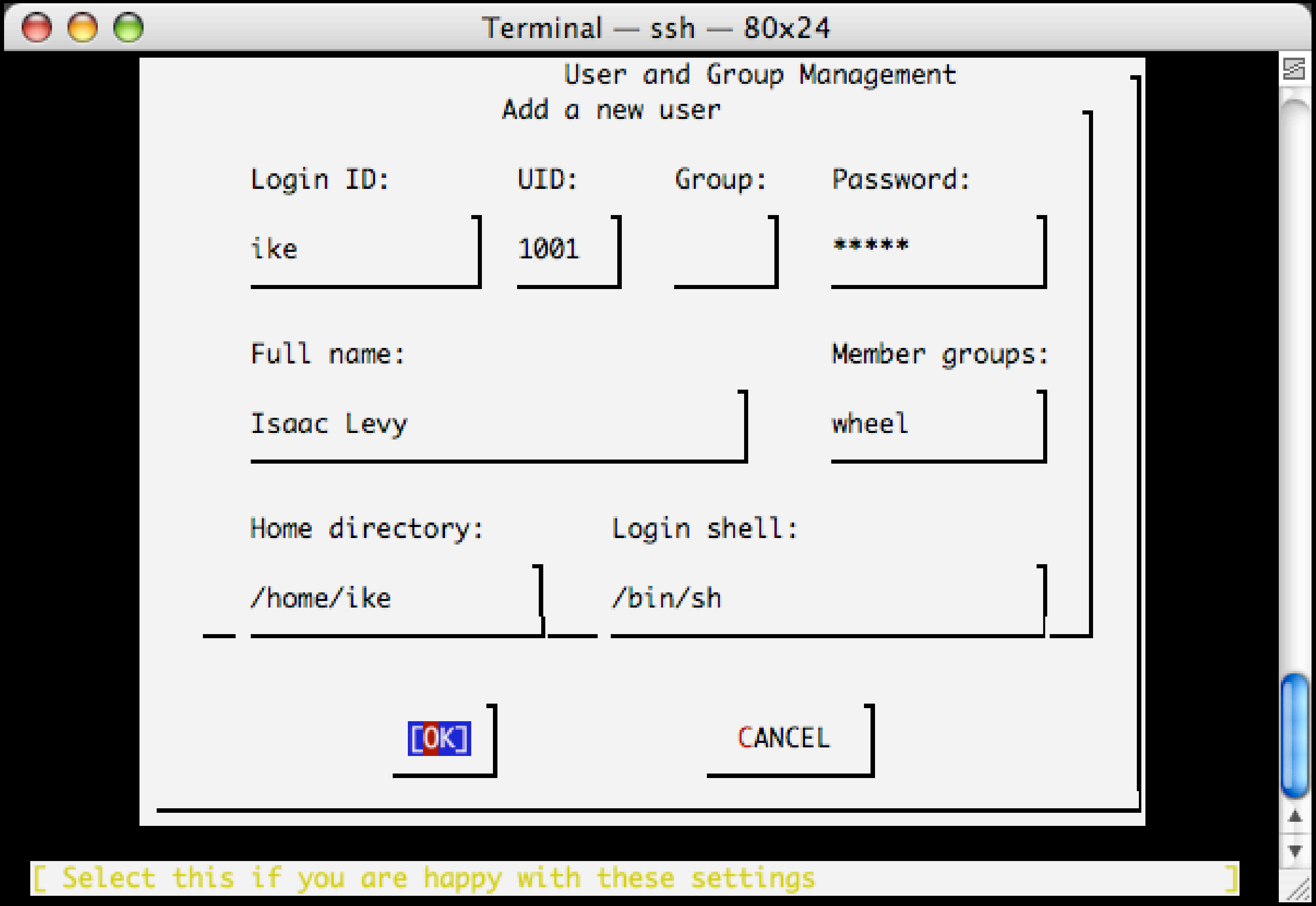
add users



```
                     User and group management
 The submenus here allow to manipulate user groups and
 login accounts.

 ┌──────────────────────────────────────────────────────────
 │  X Exit   Exit this menu (returning to previous)
 │  User     Add a new user to the system.
 │  Group    Add a new user group to the system.
 │

                  [  OK  ]        Cancel
 ───────[ Configure your user groups and users ]─────────
```

configure - call jailed sh

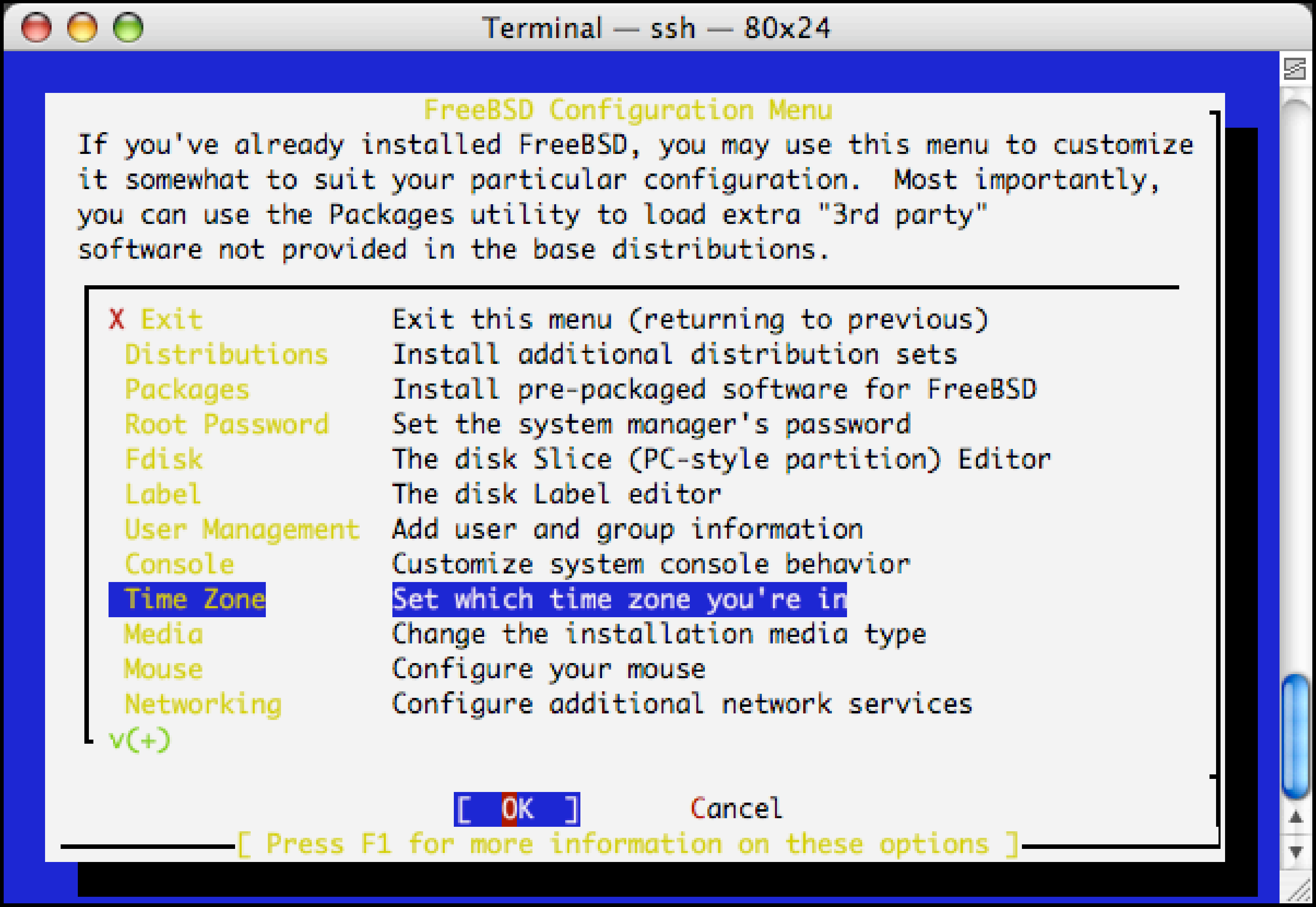
add users



```
                         User and Group Management
                              Add a new user

     Login ID:          UID:        Group:      Password:

     ike                1001                    *****

     Full name:                                 Member groups:

     Isaac Levy                                 wheel

     Home directory:          Login shell:

     /home/ike                /bin/sh

                  [OK]                    CANCEL

[ Select this if you are happy with these settings                          ]
```

configure - call jailed sh

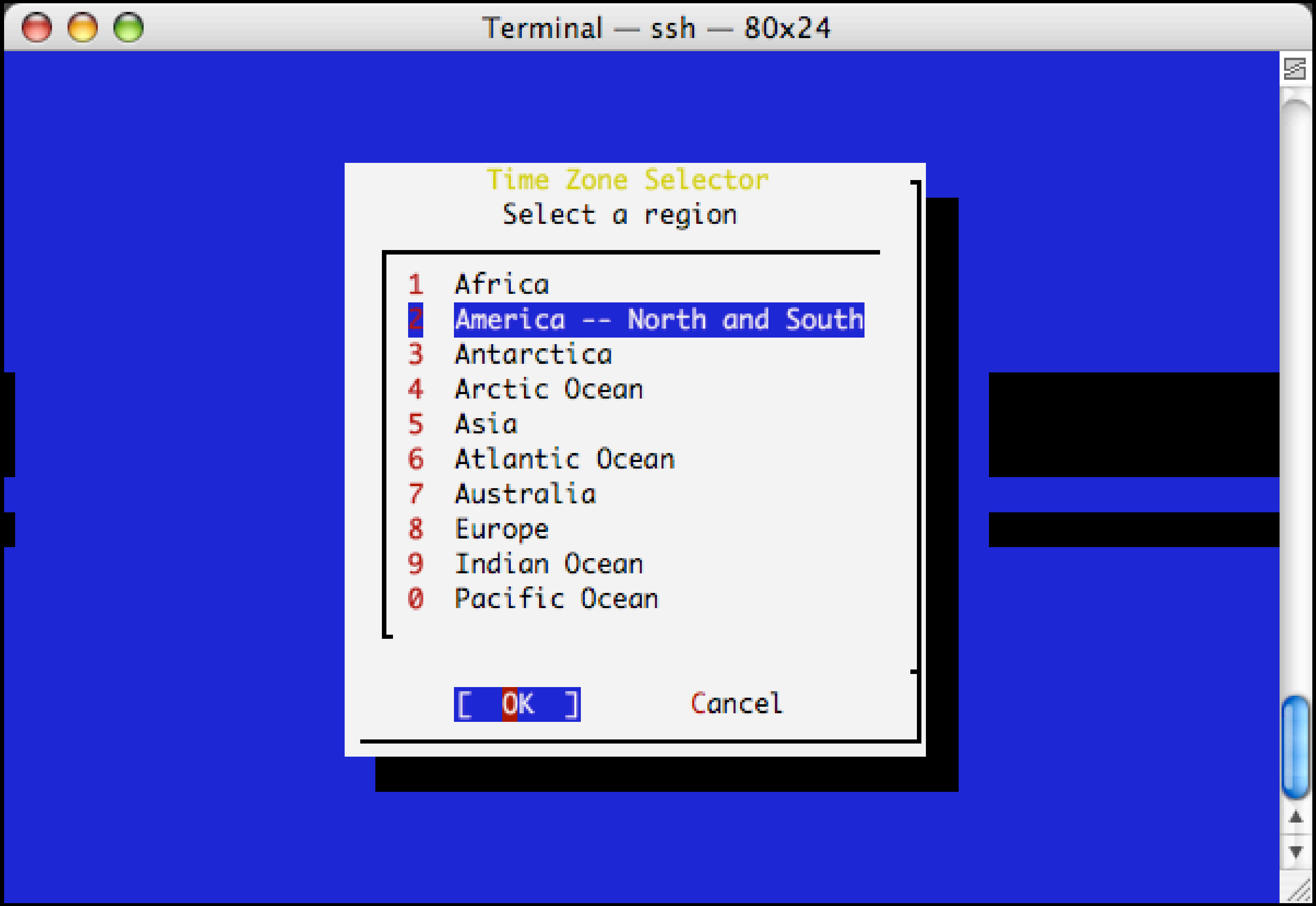
set timezone



```
                        FreeBSD Configuration Menu
 If you've already installed FreeBSD, you may use this menu to customize
 it somewhat to suit your particular configuration.  Most importantly,
 you can use the Packages utility to load extra "3rd party"
 software not provided in the base distributions.

   X Exit              Exit this menu (returning to previous)
     Distributions     Install additional distribution sets
     Packages          Install pre-packaged software for FreeBSD
     Root Password     Set the system manager's password
     Fdisk             The disk Slice (PC-style partition) Editor
     Label             The disk Label editor
     User Management   Add user and group information
     Console           Customize system console behavior
     Time Zone         Set which time zone you're in
     Media             Change the installation media type
     Mouse             Configure your mouse
     Networking        Configure additional network services
   v(+)

                       [  OK  ]       Cancel
              [ Press F1 for more information on these options ]
```

configure - call jailed sh

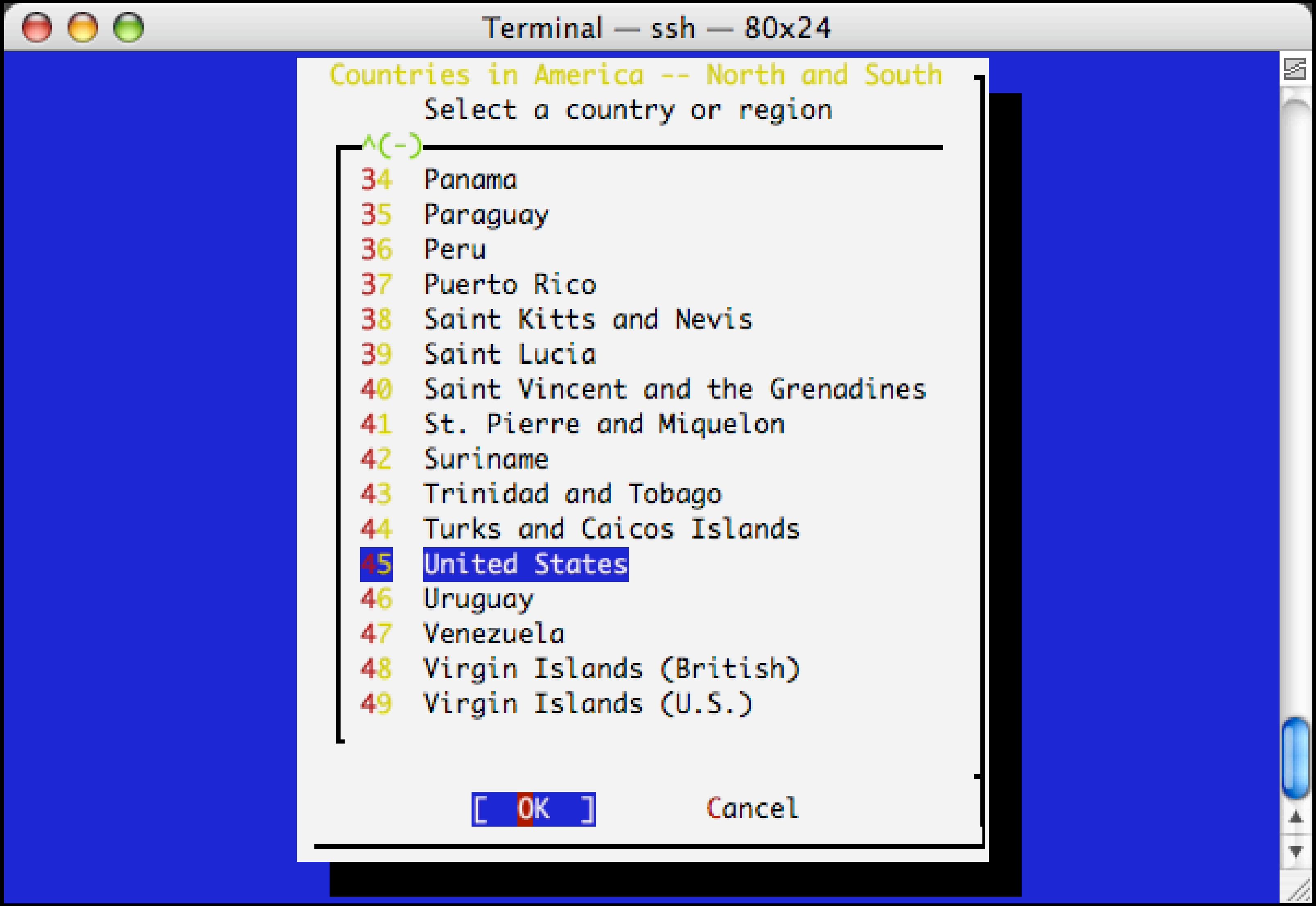
set timezone



```
              Time Zone Selector
              Select a region

   1   Africa
   2   America -- North and South
   3   Antarctica
   4   Arctic Ocean
   5   Asia
   6   Atlantic Ocean
   7   Australia
   8   Europe
   9   Indian Ocean
   0   Pacific Ocean

       [  OK  ]        Cancel
```

configure - call jailed sh

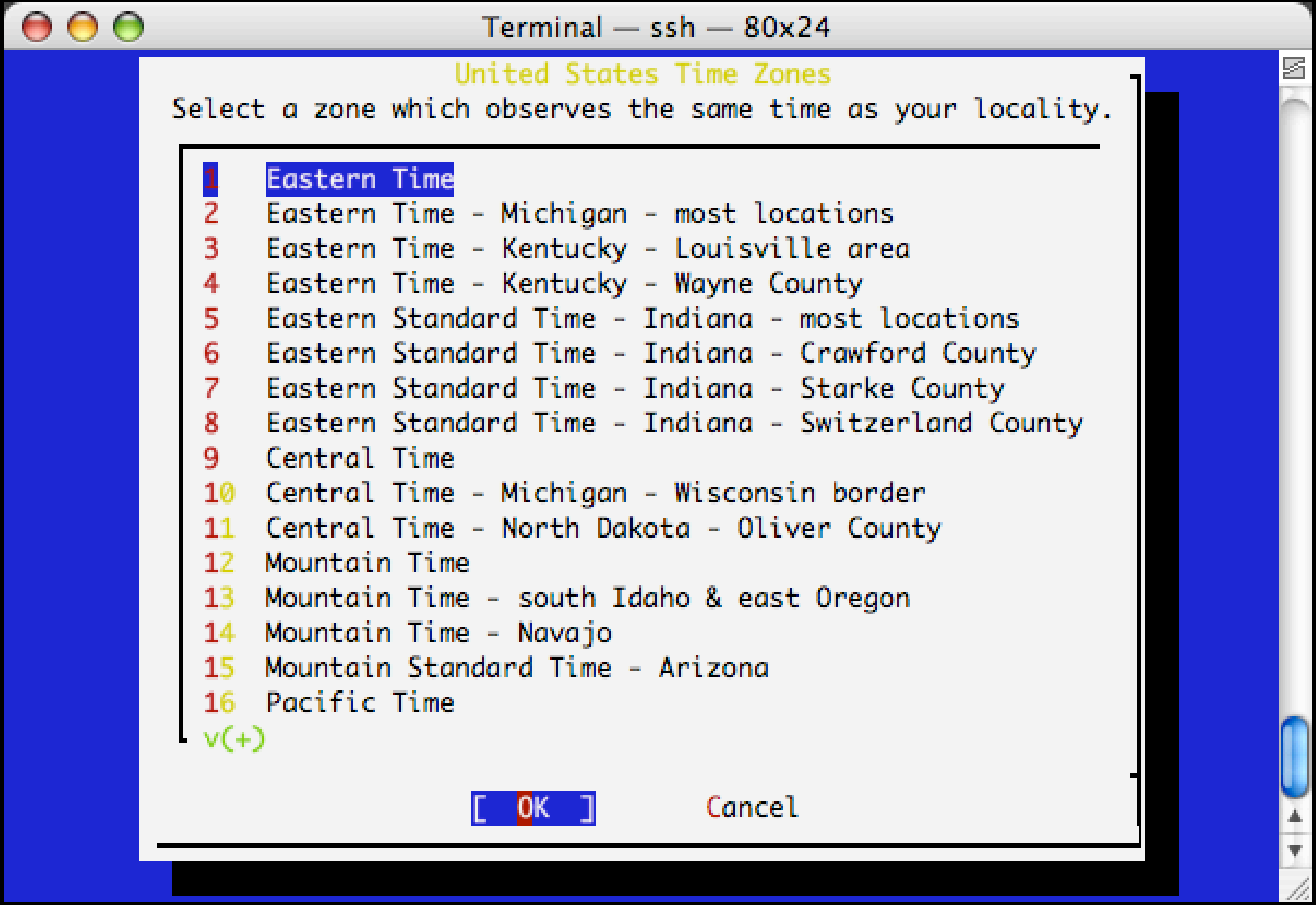
set timezone



```
Countries in America -- North and South
     Select a country or region
 ^(-)
 34  Panama
 35  Paraguay
 36  Peru
 37  Puerto Rico
 38  Saint Kitts and Nevis
 39  Saint Lucia
 40  Saint Vincent and the Grenadines
 41  St. Pierre and Miquelon
 42  Suriname
 43  Trinidad and Tobago
 44  Turks and Caicos Islands
 45  United States
 46  Uruguay
 47  Venezuela
 48  Virgin Islands (British)
 49  Virgin Islands (U.S.)

          [  OK  ]        Cancel
```

configure - call jailed sh

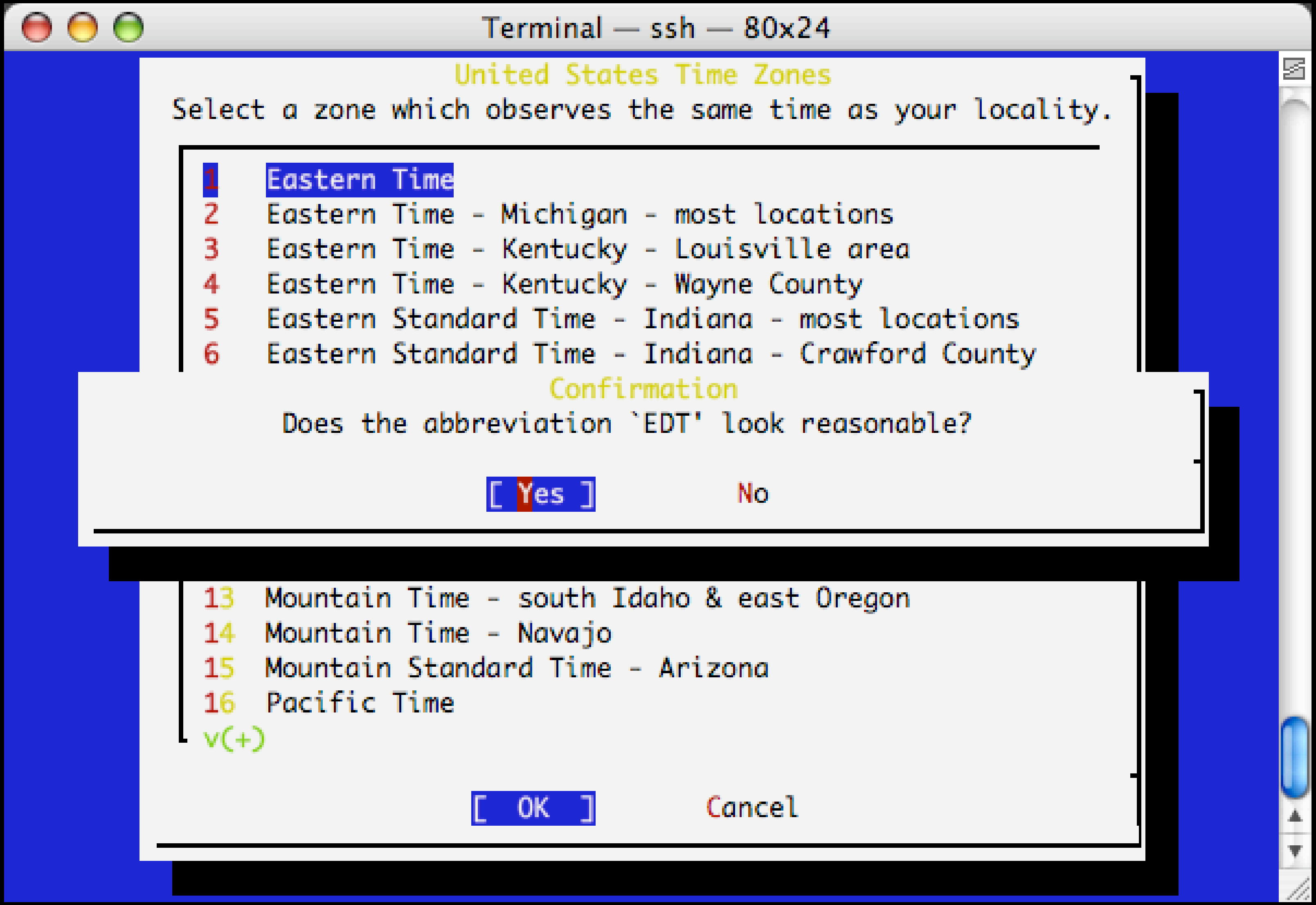
set timezone



```
                         United States Time Zones
  Select a zone which observes the same time as your locality.

   1    Eastern Time
   2    Eastern Time - Michigan - most locations
   3    Eastern Time - Kentucky - Louisville area
   4    Eastern Time - Kentucky - Wayne County
   5    Eastern Standard Time - Indiana - most locations
   6    Eastern Standard Time - Indiana - Crawford County
   7    Eastern Standard Time - Indiana - Starke County
   8    Eastern Standard Time - Indiana - Switzerland County
   9    Central Time
   10   Central Time - Michigan - Wisconsin border
   11   Central Time - North Dakota - Oliver County
   12   Mountain Time
   13   Mountain Time - south Idaho & east Oregon
   14   Mountain Time - Navajo
   15   Mountain Standard Time - Arizona
   16   Pacific Time
   v(+)

                     [  OK  ]        Cancel
```

configure - call jailed sh

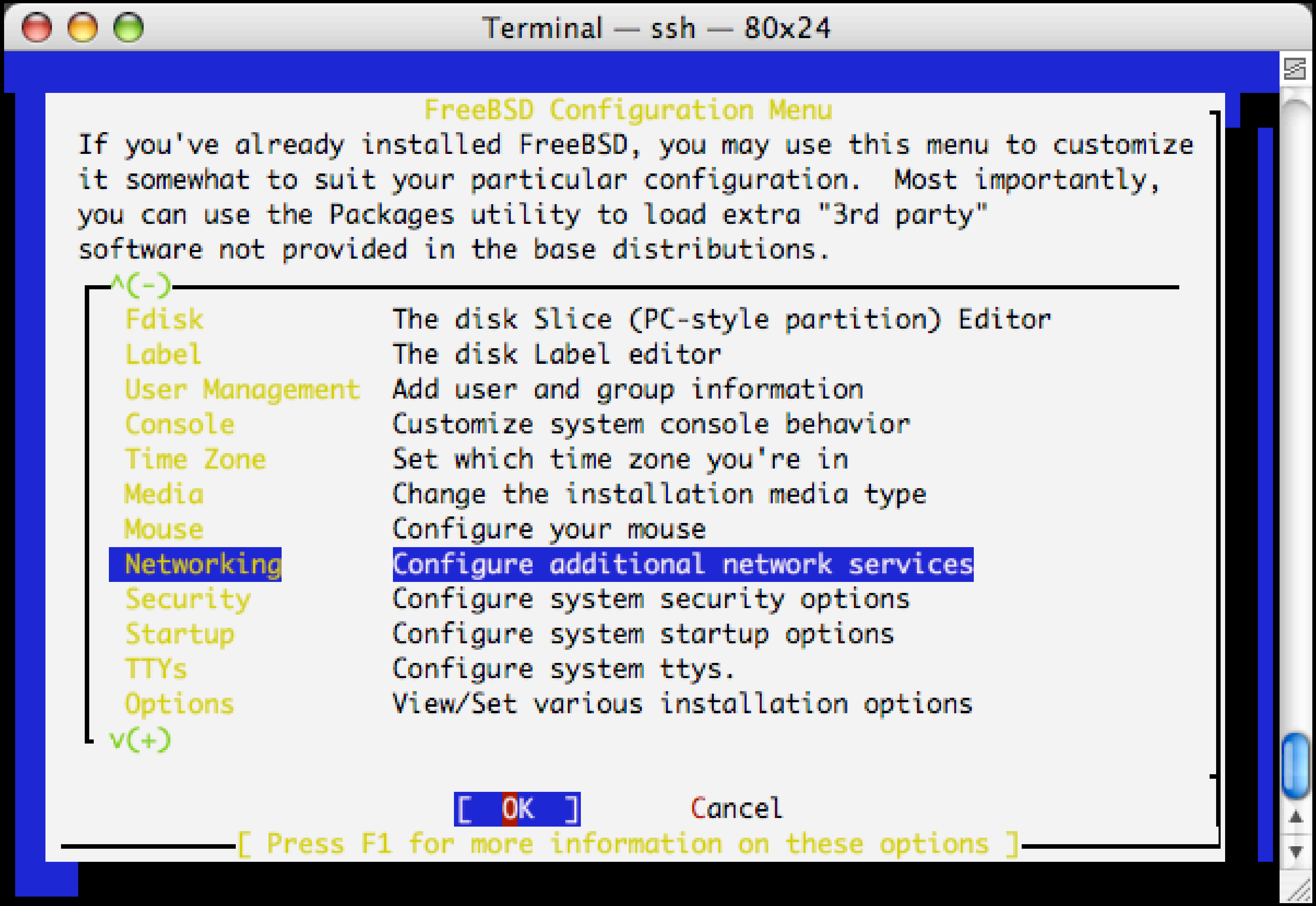
set timezone



```
                      United States Time Zones
 Select a zone which observes the same time as your locality.

   1    Eastern Time
   2    Eastern Time - Michigan - most locations
   3    Eastern Time - Kentucky - Louisville area
   4    Eastern Time - Kentucky - Wayne County
   5    Eastern Standard Time - Indiana - most locations
   6    Eastern Standard Time - Indiana - Crawford County
                        Confirmation
       Does the abbreviation `EDT' look reasonable?

                  [ Yes ]         No

   13   Mountain Time - south Idaho & east Oregon
   14   Mountain Time - Navajo
   15   Mountain Standard Time - Arizona
   16   Pacific Time
   v(+)

                 [  OK  ]        Cancel
```

configure - call jailed sh

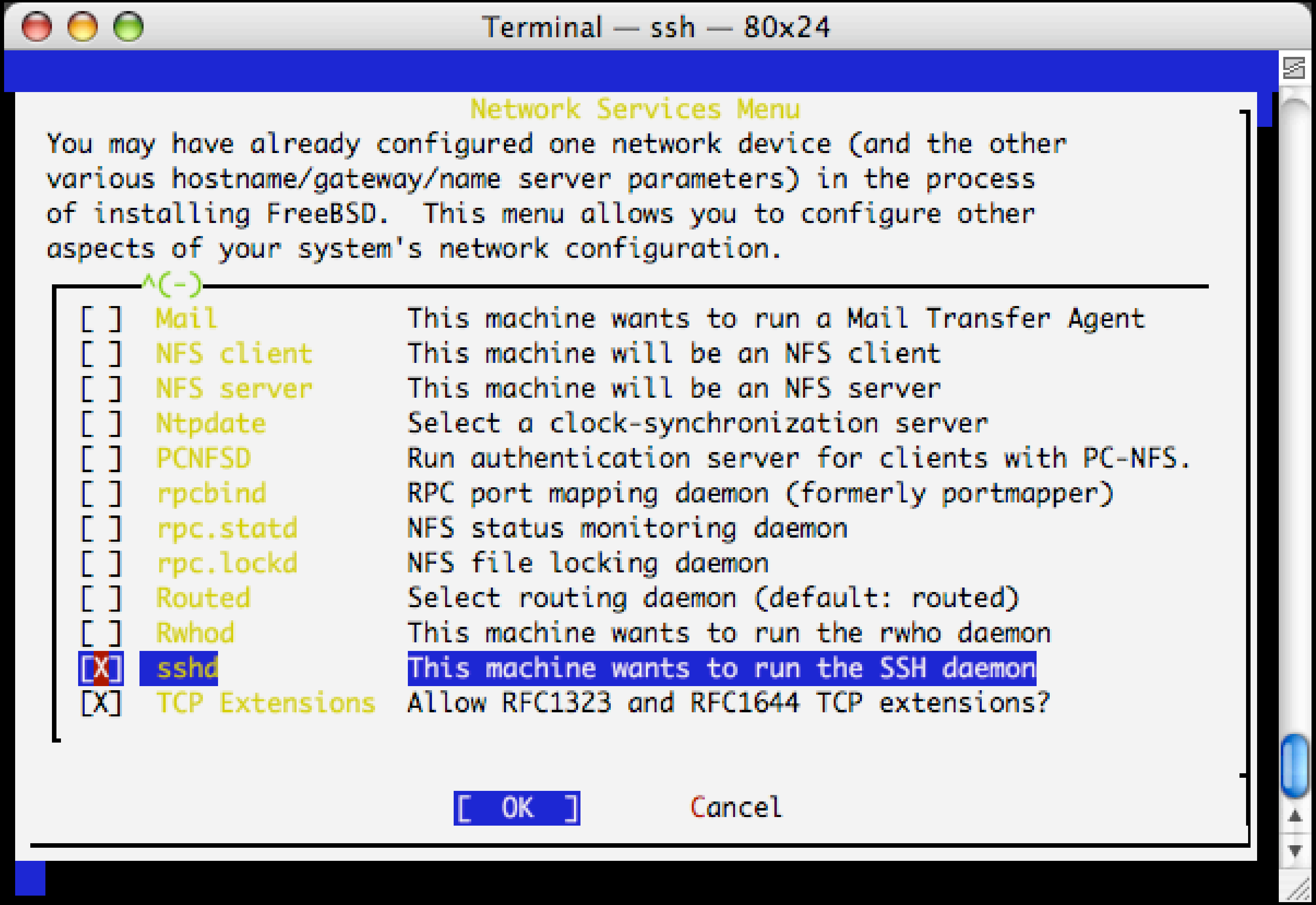
network options...



```
                     FreeBSD Configuration Menu
 If you've already installed FreeBSD, you may use this menu to customize
 it somewhat to suit your particular configuration.  Most importantly,
 you can use the Packages utility to load extra "3rd party"
 software not provided in the base distributions.
 ┌^(-)──────────────────────────────────────────────────────────────────
 │  Fdisk            The disk Slice (PC-style partition) Editor
 │  Label            The disk Label editor
 │  User Management  Add user and group information
 │  Console          Customize system console behavior
 │  Time Zone        Set which time zone you're in
 │  Media            Change the installation media type
 │  Mouse            Configure your mouse
 │  Networking       Configure additional network services
 │  Security         Configure system security options
 │  Startup          Configure system startup options
 │  TTYs             Configure system ttys.
 │  Options          View/Set various installation options
 └ v(+)

                [  OK  ]         Cancel
 ───────────[ Press F1 for more information on these options ]──────────
```

configure - call jailed sh

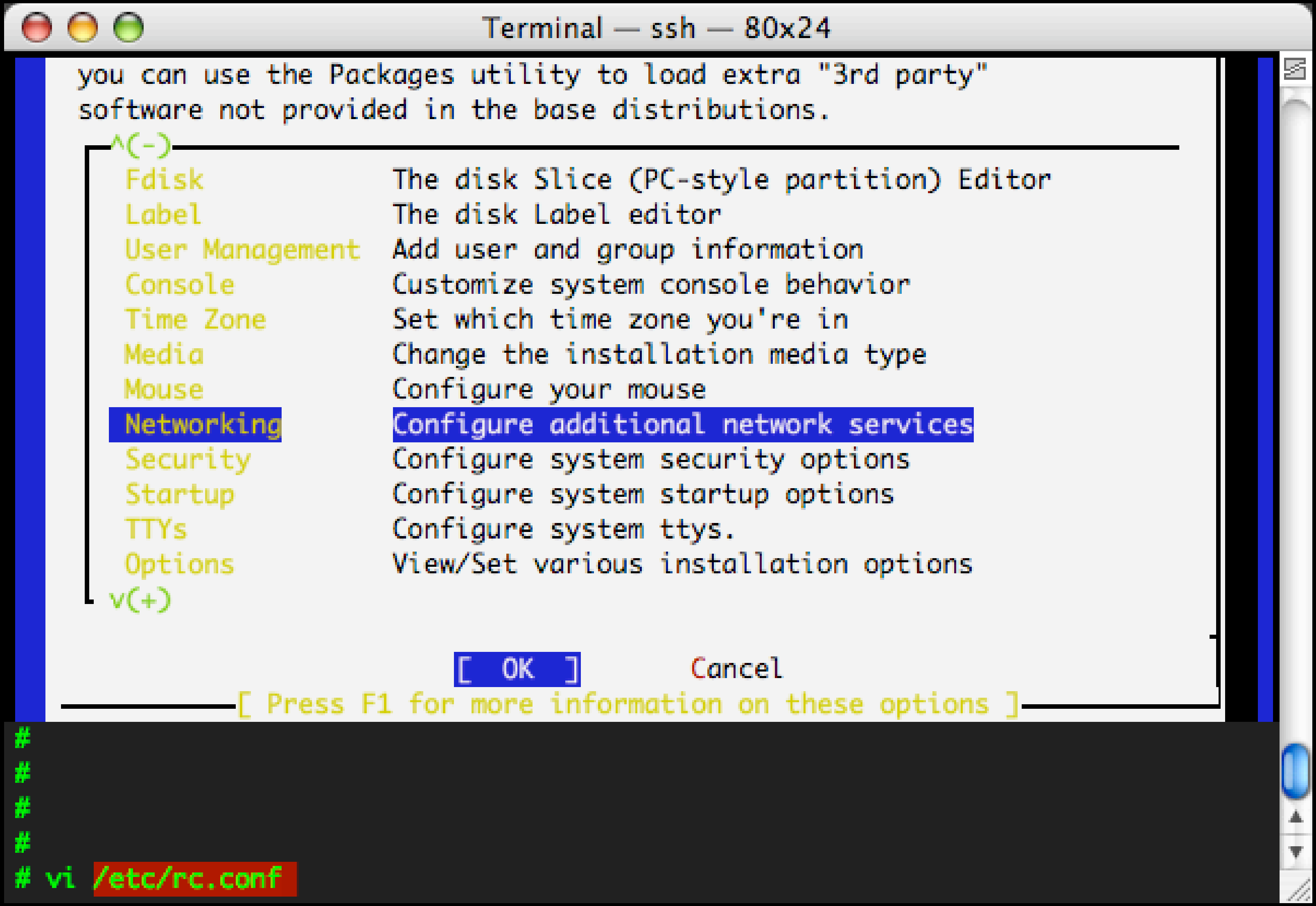
run ssh, **important**



```
                        Network Services Menu
You may have already configured one network device (and the other
various hostname/gateway/name server parameters) in the process
of installing FreeBSD.  This menu allows you to configure other
aspects of your system's network configuration.
  ^(-)
 [ ]  Mail           This machine wants to run a Mail Transfer Agent
 [ ]  NFS client     This machine will be an NFS client
 [ ]  NFS server     This machine will be an NFS server
 [ ]  Ntpdate        Select a clock-synchronization server
 [ ]  PCNFSD         Run authentication server for clients with PC-NFS.
 [ ]  rpcbind        RPC port mapping daemon (formerly portmapper)
 [ ]  rpc.statd      NFS status monitoring daemon
 [ ]  rpc.lockd      NFS file locking daemon
 [ ]  Routed         Select routing daemon (default: routed)
 [ ]  Rwhod          This machine wants to run the rwho daemon
 [X]  sshd           This machine wants to run the SSH daemon
 [X]  TCP Extensions Allow RFC1323 and RFC1644 TCP extensions?

                     [  OK  ]       Cancel
```

configure - call jailed sh

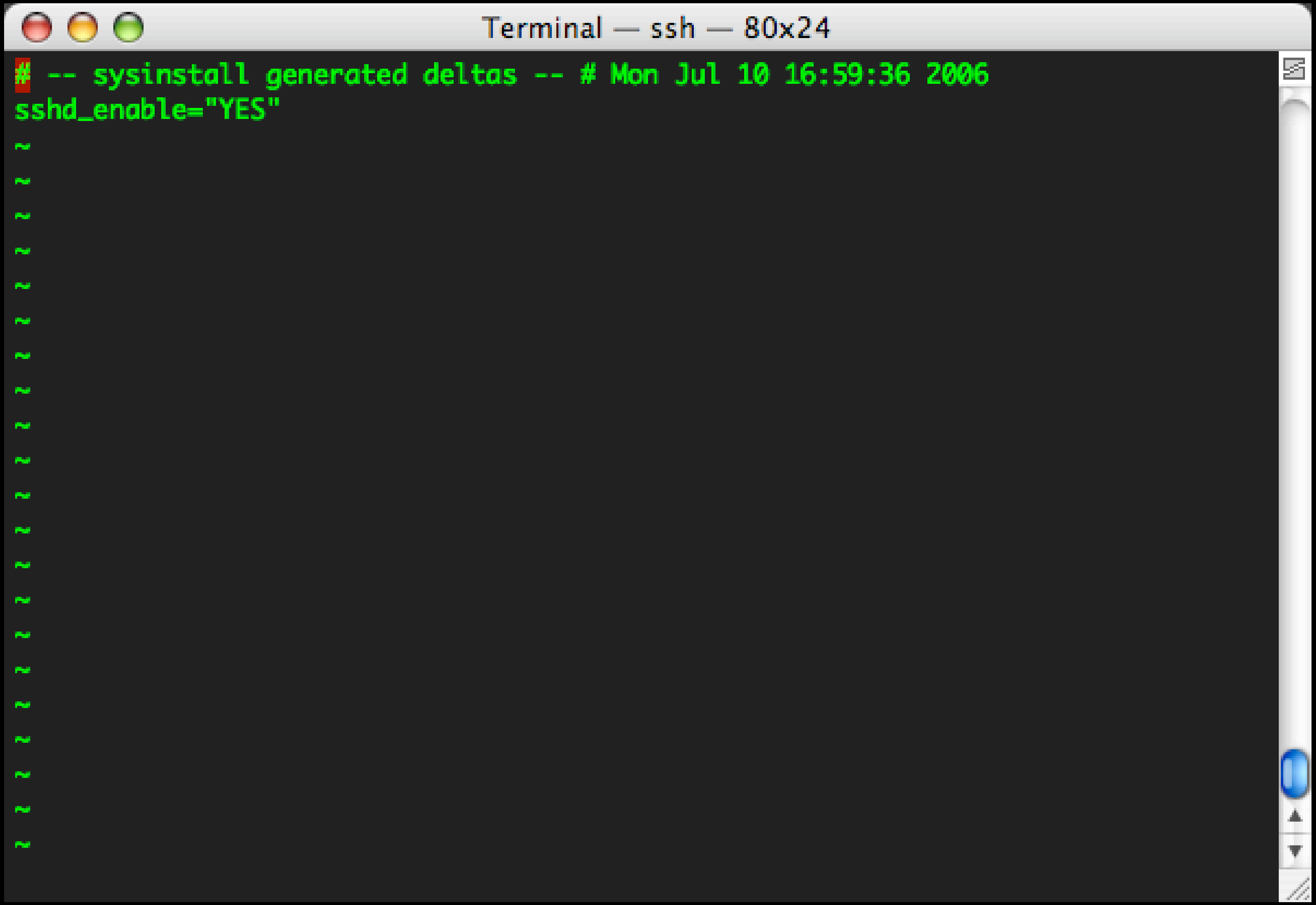
check rc.conf in jail



```
 you can use the Packages utility to load extra "3rd party"
 software not provided in the base distributions.
 ┌^(-)──────────────────────────────────────────────────────────
 │  Fdisk            The disk Slice (PC-style partition) Editor
 │  Label            The disk Label editor
 │  User Management  Add user and group information
 │  Console          Customize system console behavior
 │  Time Zone        Set which time zone you're in
 │  Media            Change the installation media type
 │  Mouse            Configure your mouse
 │  Networking       Configure additional network services
 │  Security         Configure system security options
 │  Startup          Configure system startup options
 │  TTYs             Configure system ttys.
 │  Options          View/Set various installation options
 └ v(+)

                     [  OK  ]       Cancel
 ──────────[ Press F1 for more information on these options ]──
#
#
#
#
# vi /etc/rc.conf
```

configure - call jailed sh

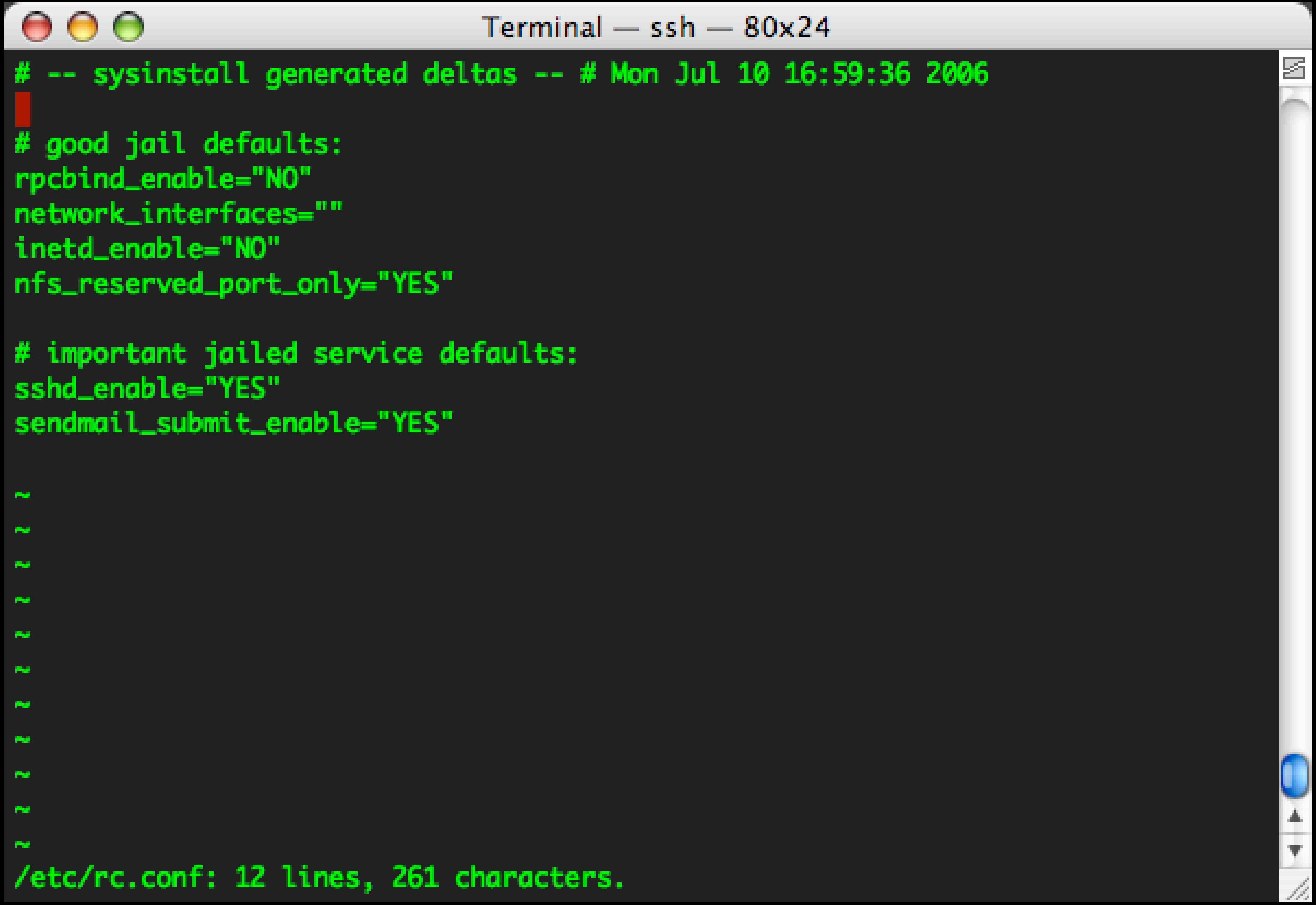
check rc.conf in jail



```
# -- sysinstall generated deltas -- # Mon Jul 10 16:59:36 2006
sshd_enable="YES"
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
```

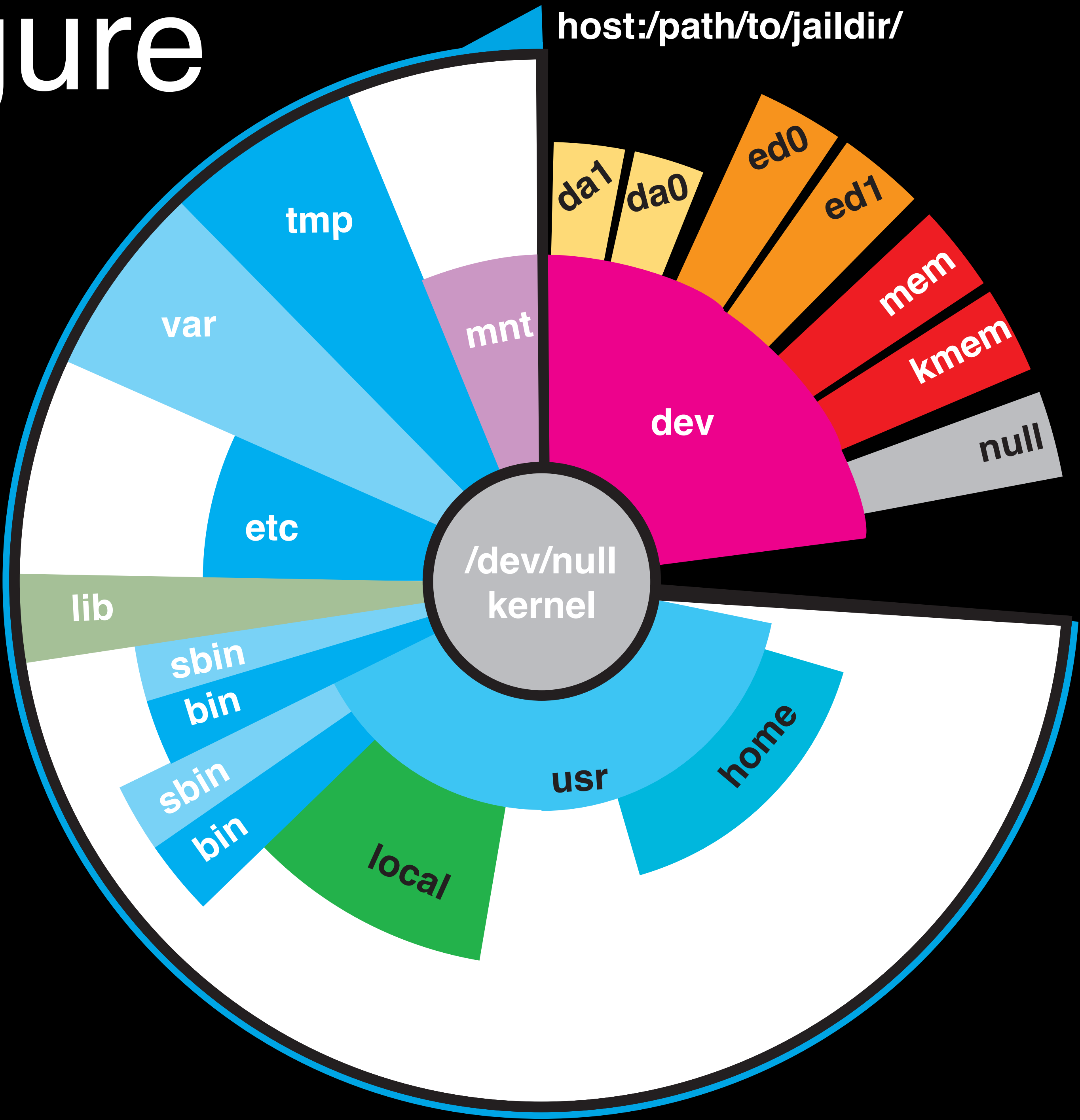
configure - call jailed sh

jail-specific stuff (just use common sense)

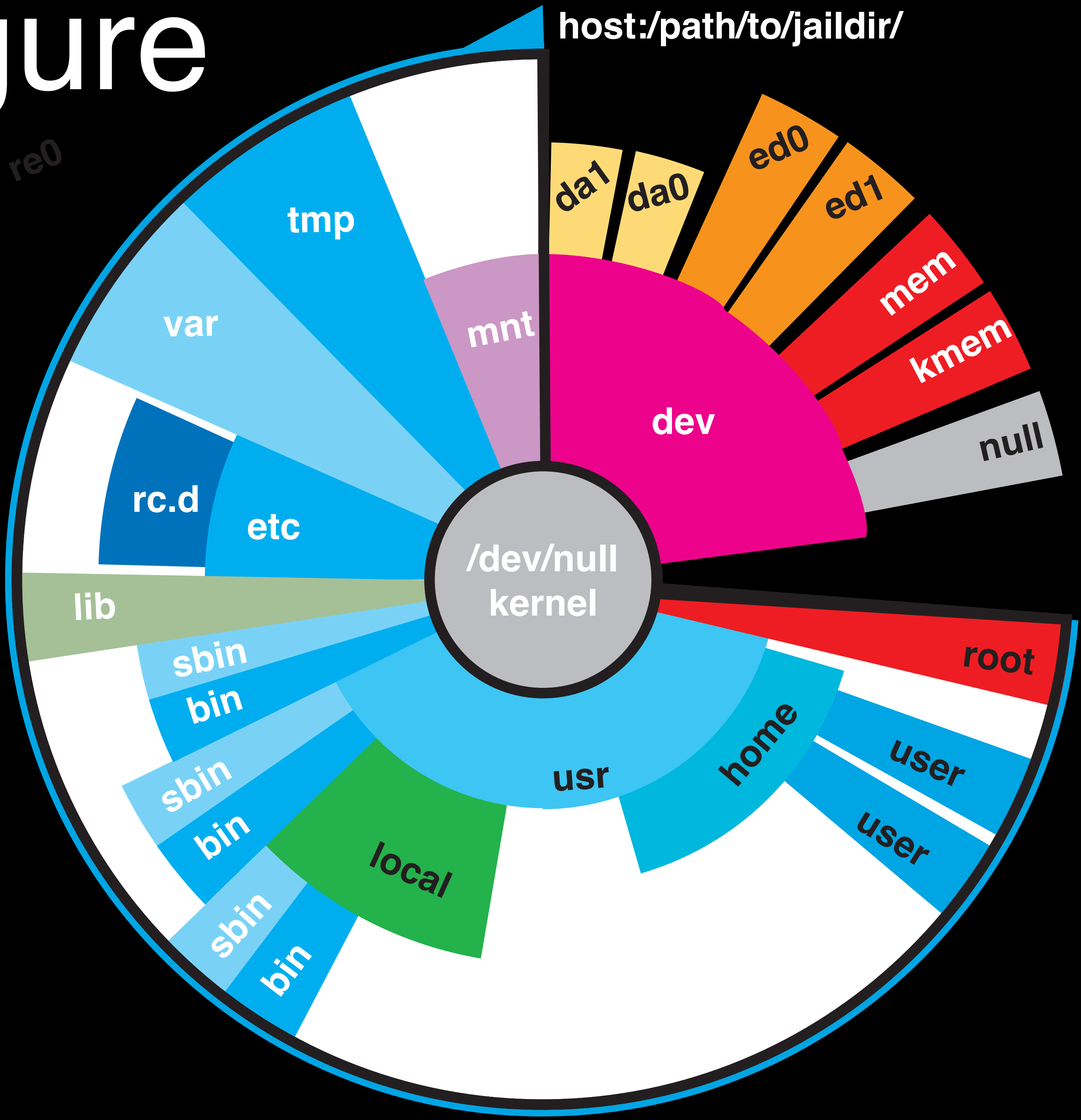


```
# -- sysinstall generated deltas -- # Mon Jul 10 16:59:36 2006

# good jail defaults:
rpcbind_enable="NO"
network_interfaces=""
inetd_enable="NO"
nfs_reserved_port_only="YES"

# important jailed service defaults:
sshd_enable="YES"
sendmail_submit_enable="YES"


~
~
~
~
~
~
~
~
~
~
~
/etc/rc.conf: 12 lines, 261 characters.
```

configure

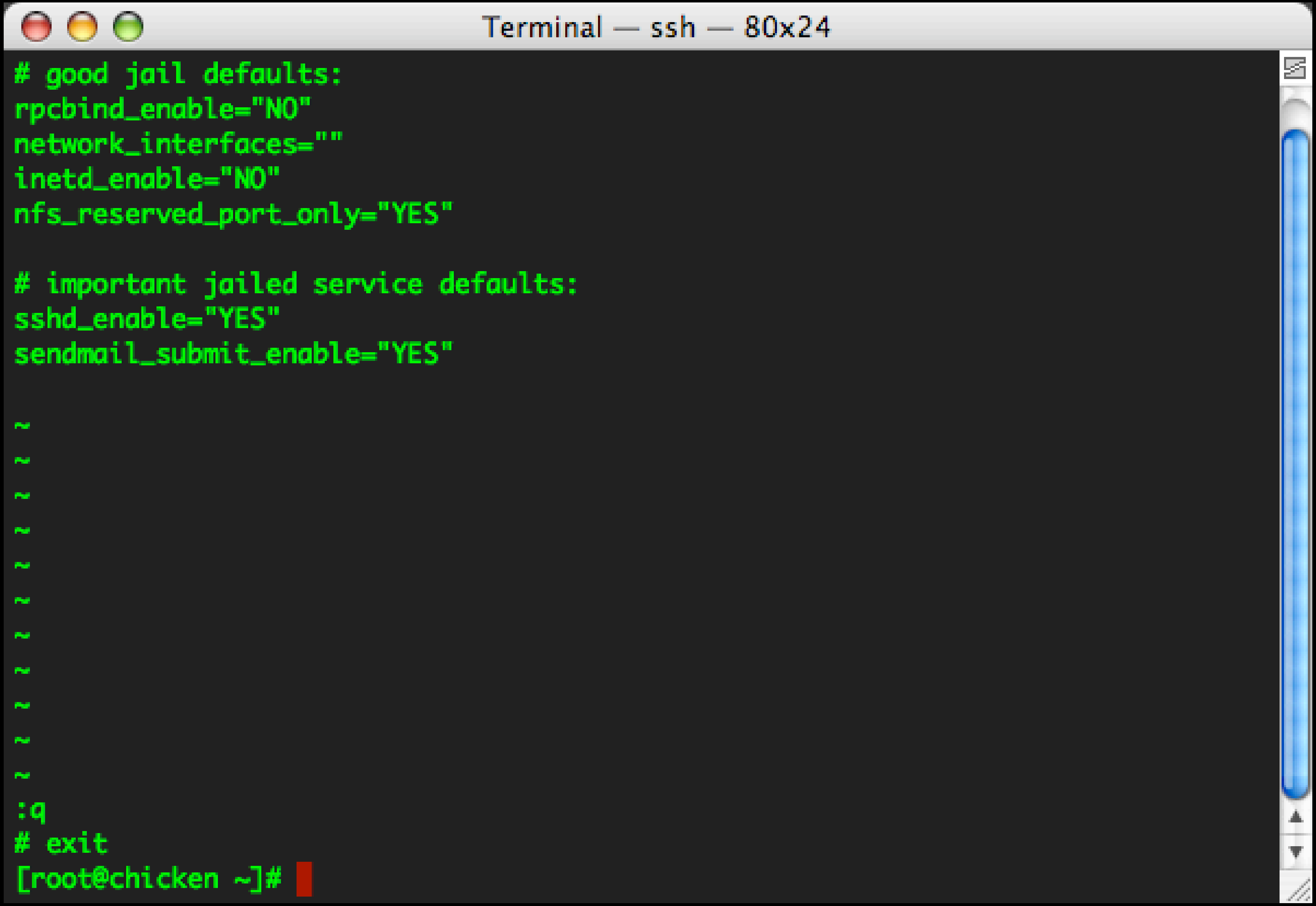

host:/path/to/jaildir/

configure


re0
host:/path/to/jaildir/
tmp
var
mnt
dev
da1
da0
ed0
ed1
mem
kmem
null
rc.d
etc
lib
/dev/null
kernel
root
sbin
bin
sbin
bin
sbin
bin
local
usr
home
user
user

configure - call jailed sh

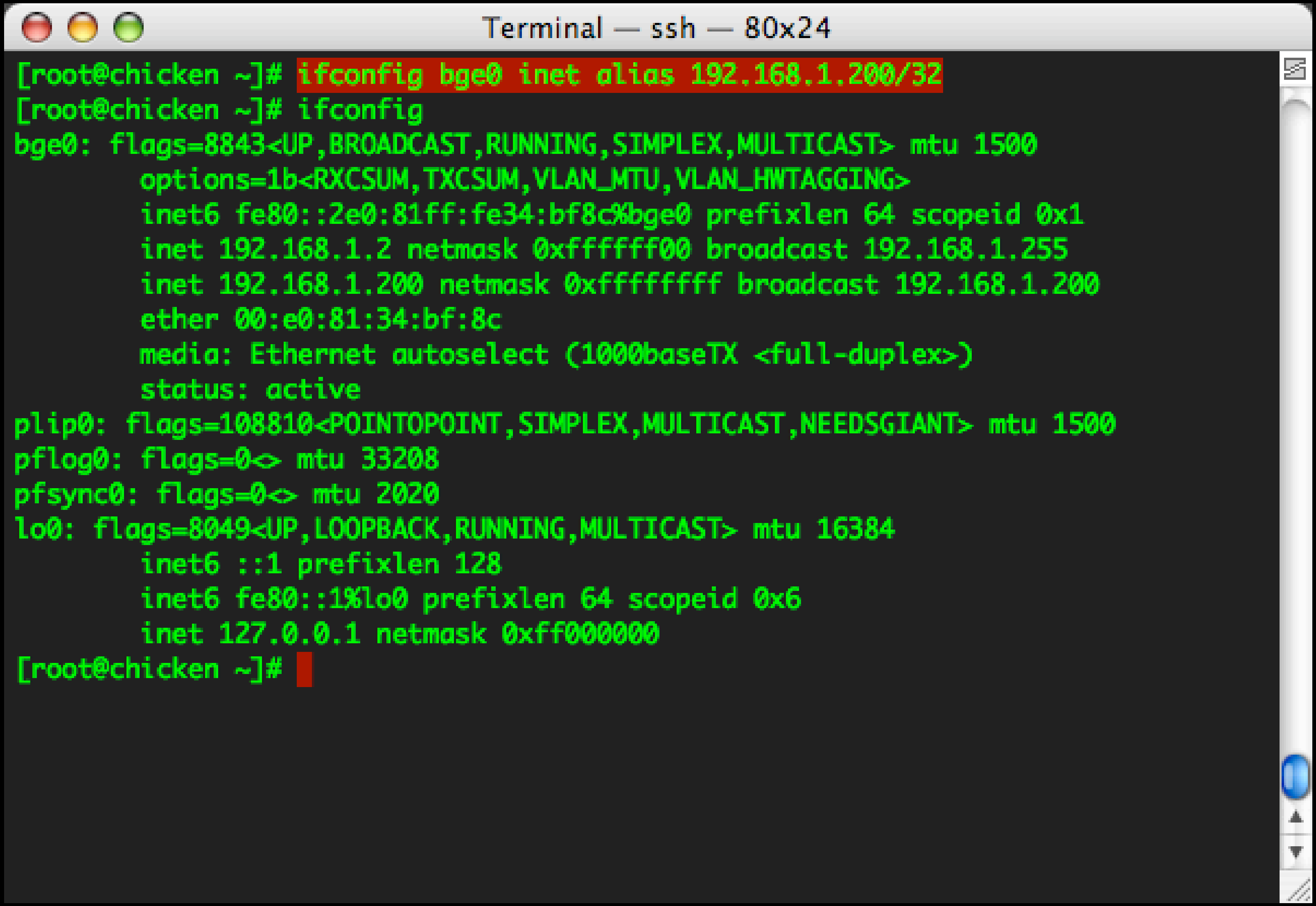
we’re finished configuring jailed system!



```
# good jail defaults:
rpcbind_enable="NO"
network_interfaces=""
inetd_enable="NO"
nfs_reserved_port_only="YES"

# important jailed service defaults:
sshd_enable="YES"
sendmail_submit_enable="YES"

~
~
~
~
~
~
~
~
~
~
~
:q
# exit
[root@chicken ~]#
```

configure - assign ip alias

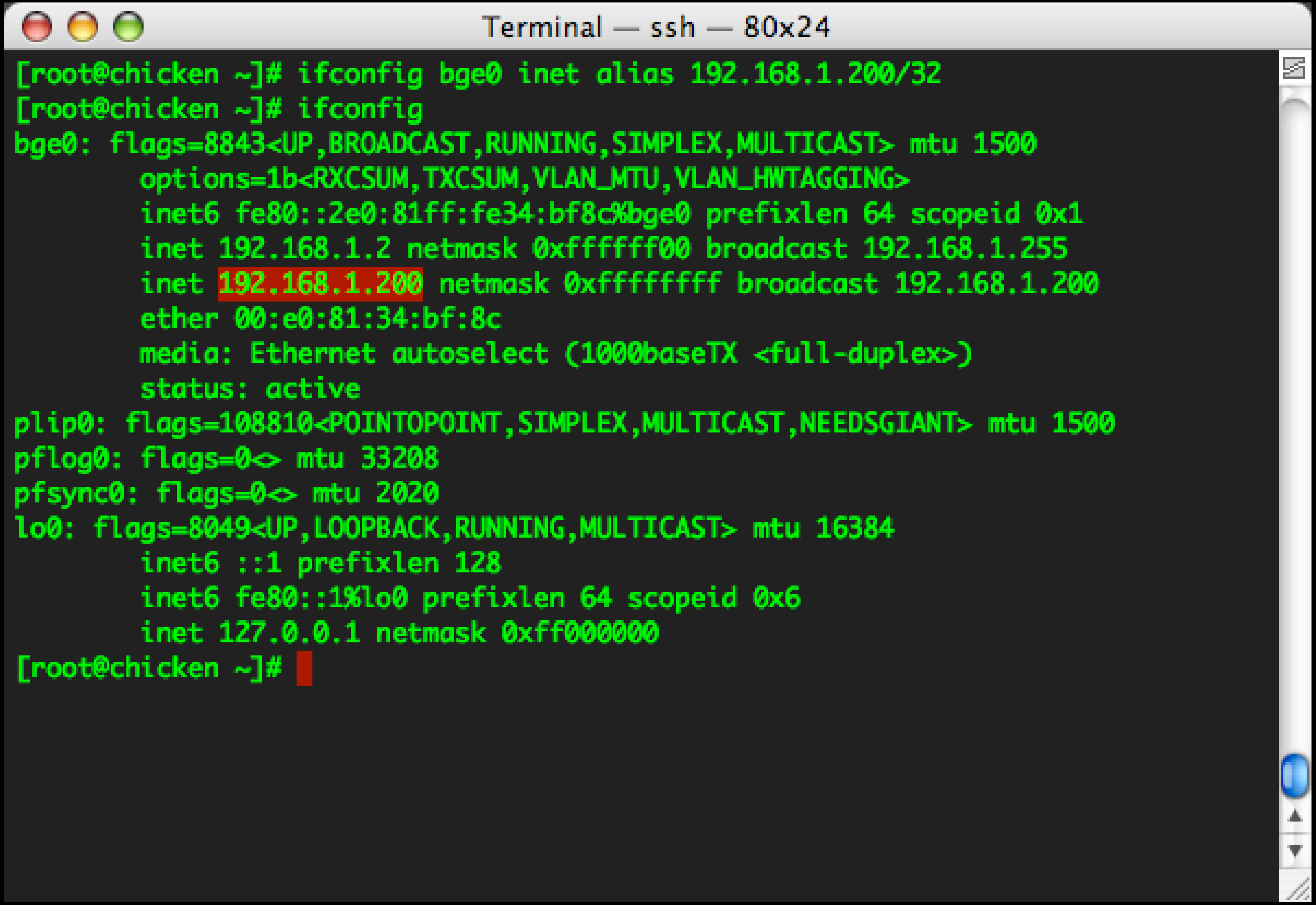
(use ifconfig)



```
[root@chicken ~]# ifconfig bge0 inet alias 192.168.1.200/32
[root@chicken ~]# ifconfig
bge0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=1b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING>
        inet6 fe80::2e0:81ff:fe34:bf8c%bge0 prefixlen 64 scopeid 0x1
        inet 192.168.1.2 netmask 0xffffff00 broadcast 192.168.1.255
        inet 192.168.1.200 netmask 0xffffffff broadcast 192.168.1.200
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x6
        inet 127.0.0.1 netmask 0xff000000
[root@chicken ~]# 
```

configure - assign ip alias

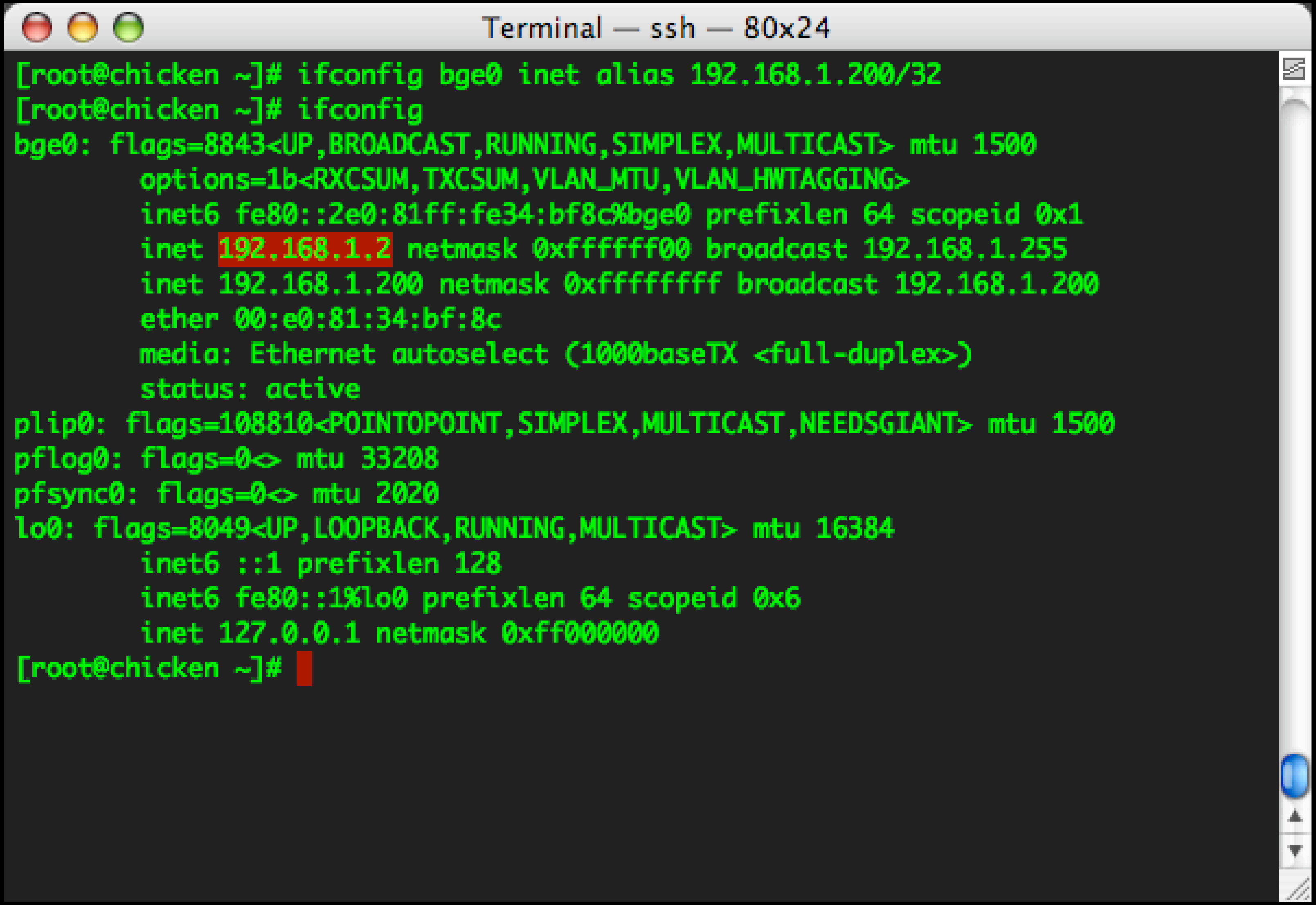
(ip for the jail)



```
[root@chicken ~]# ifconfig bge0 inet alias 192.168.1.200/32
[root@chicken ~]# ifconfig
bge0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=1b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING>
        inet6 fe80::2e0:81ff:fe34:bf8c%bge0 prefixlen 64 scopeid 0x1
        inet 192.168.1.2 netmask 0xffffff00 broadcast 192.168.1.255
        inet 192.168.1.200 netmask 0xffffffff broadcast 192.168.1.200
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x6
        inet 127.0.0.1 netmask 0xff000000
[root@chicken ~]# 
```

configure - assign ip alias

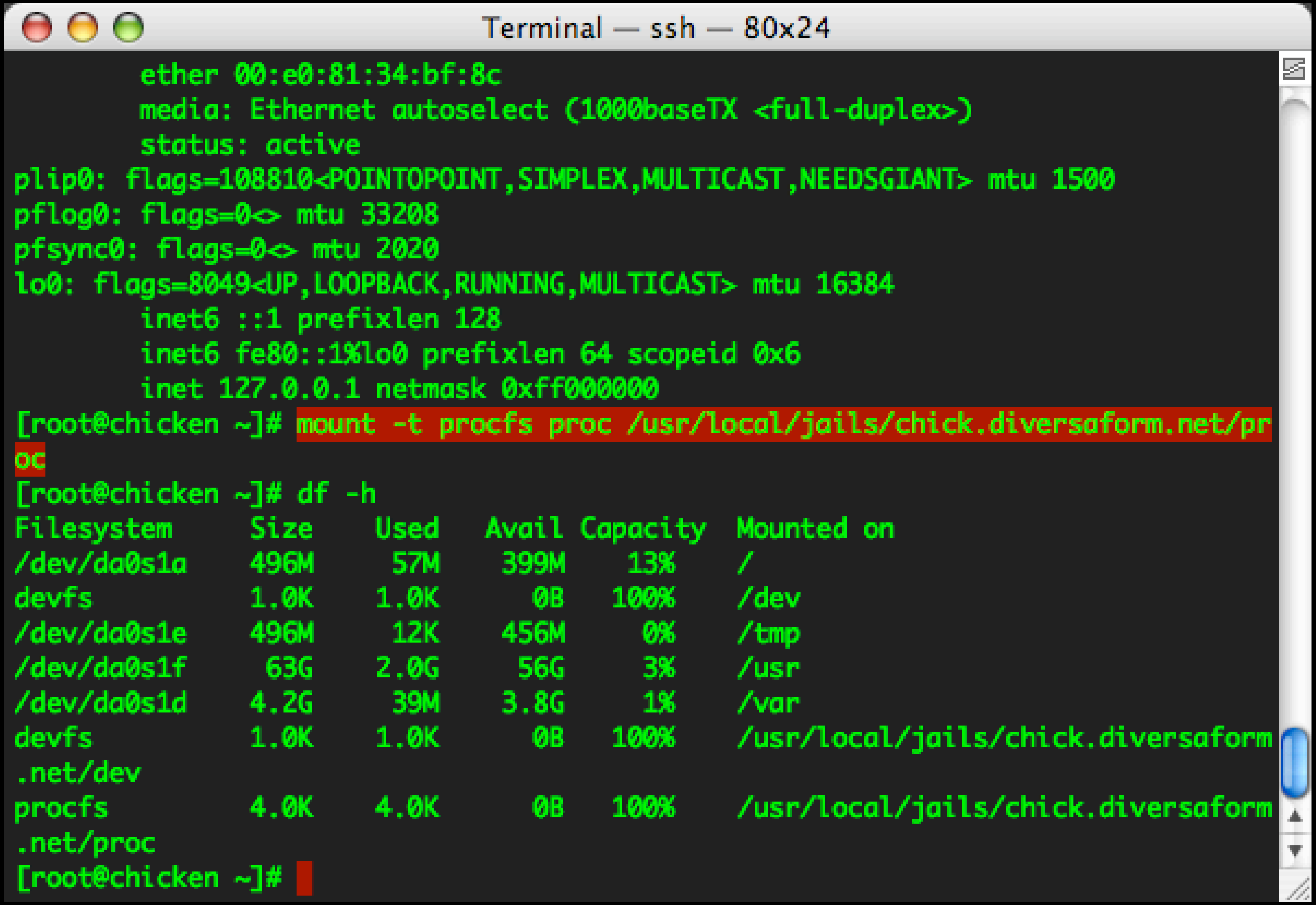
(original ip for the host machine)



```
[root@chicken ~]# ifconfig bge0 inet alias 192.168.1.200/32
[root@chicken ~]# ifconfig
bge0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=1b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING>
        inet6 fe80::2e0:81ff:fe34:bf8c%bge0 prefixlen 64 scopeid 0x1
        inet 192.168.1.2 netmask 0xffffff00 broadcast 192.168.1.255
        inet 192.168.1.200 netmask 0xffffffff broadcast 192.168.1.200
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x6
        inet 127.0.0.1 netmask 0xff000000
[root@chicken ~]#
```

configure - call jailed sh

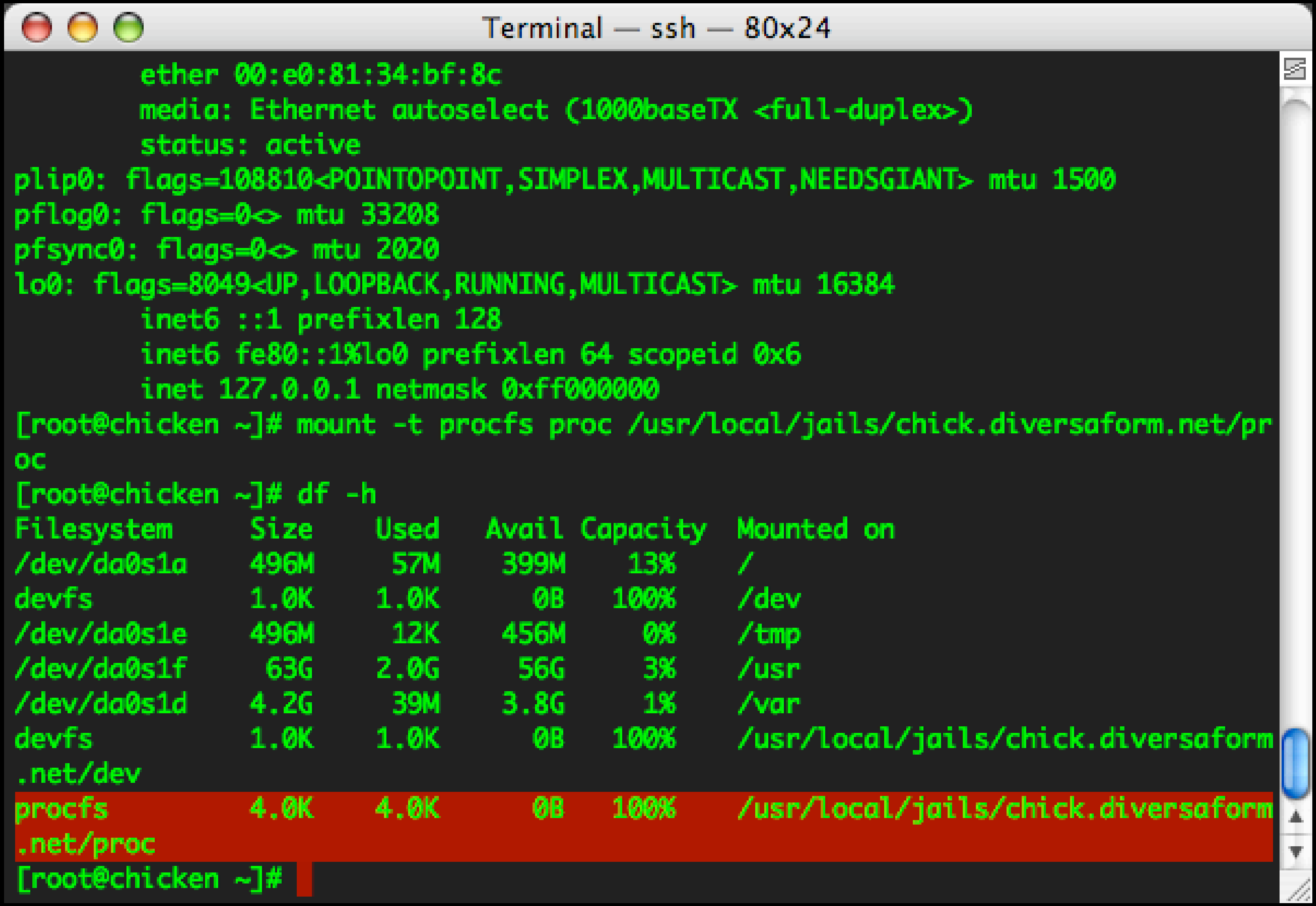
(analagous to booting a machine in su mode)



```
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x6
        inet 127.0.0.1 netmask 0xff000000
[root@chicken ~]# mount -t procfs proc /usr/local/jails/chick.diversaform.net/pr
oc
[root@chicken ~]# df -h
Filesystem     Size    Used   Avail Capacity  Mounted on
/dev/da0s1a    496M     57M    399M    13%    /
devfs          1.0K    1.0K      0B   100%    /dev
/dev/da0s1e    496M     12K    456M     0%    /tmp
/dev/da0s1f     63G    2.0G     56G     3%    /usr
/dev/da0s1d    4.2G     39M    3.8G     1%    /var
devfs          1.0K    1.0K      0B   100%    /usr/local/jails/chick.diversaform
.net/dev
procfs         4.0K    4.0K      0B   100%    /usr/local/jails/chick.diversaform
.net/proc
[root@chicken ~]# 
```

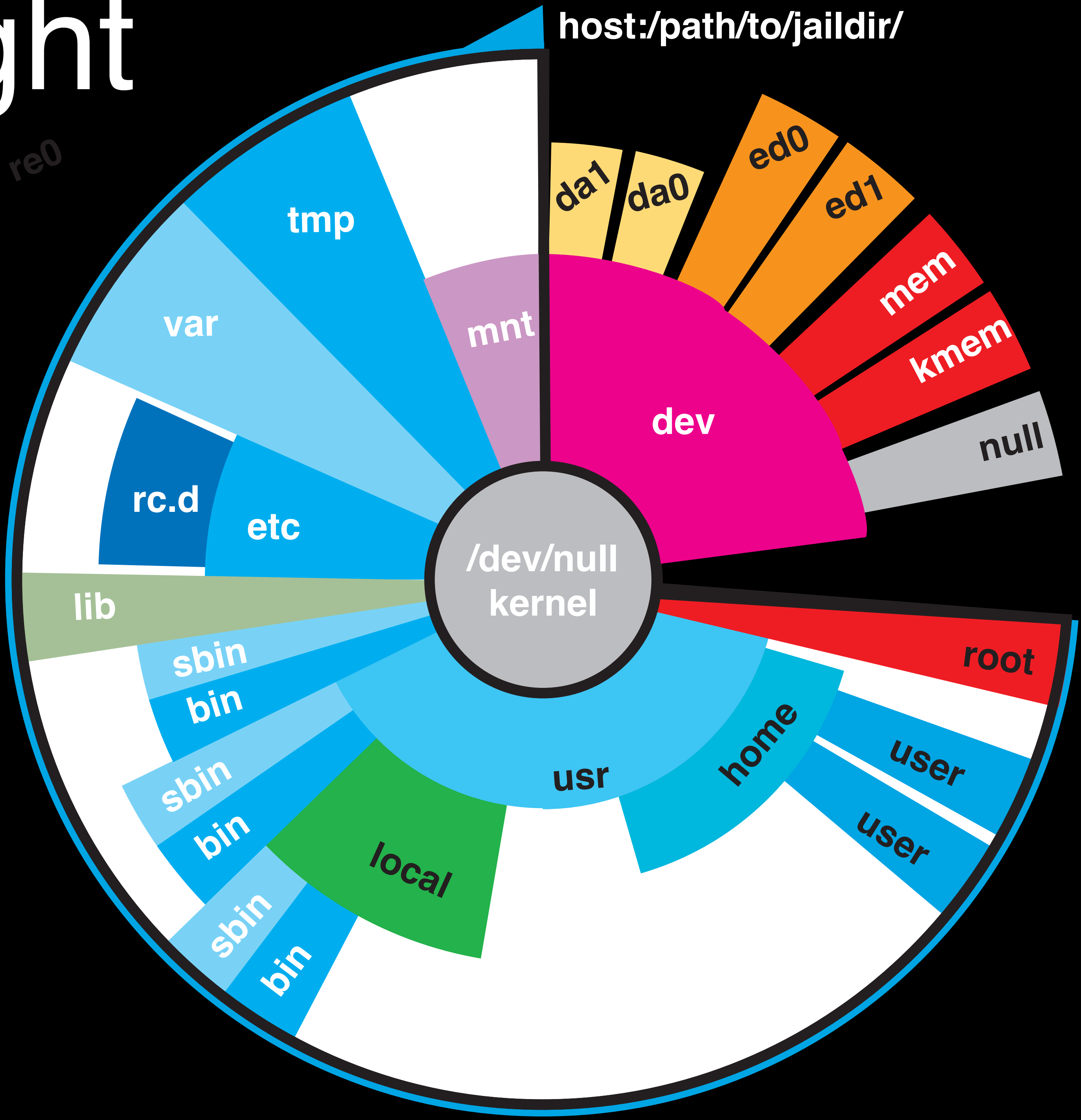
configure - call jailed sh

(analagous to booting a machine in su mode)



```
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x6
        inet 127.0.0.1 netmask 0xff000000
[root@chicken ~]# mount -t procfs proc /usr/local/jails/chick.diversaform.net/pr
oc
[root@chicken ~]# df -h
Filesystem     Size    Used   Avail Capacity  Mounted on
/dev/da0s1a    496M     57M    399M    13%    /
devfs          1.0K    1.0K      0B   100%    /dev
/dev/da0s1e    496M     12K    456M     0%    /tmp
/dev/da0s1f     63G    2.0G     56G     3%    /usr
/dev/da0s1d    4.2G     39M    3.8G     1%    /var
devfs          1.0K    1.0K      0B   100%    /usr/local/jails/chick.diversaform
.net/dev
procfs         4.0K    4.0K      0B   100%    /usr/local/jails/chick.diversaform
.net/proc
[root@chicken ~]# 
```

preflight

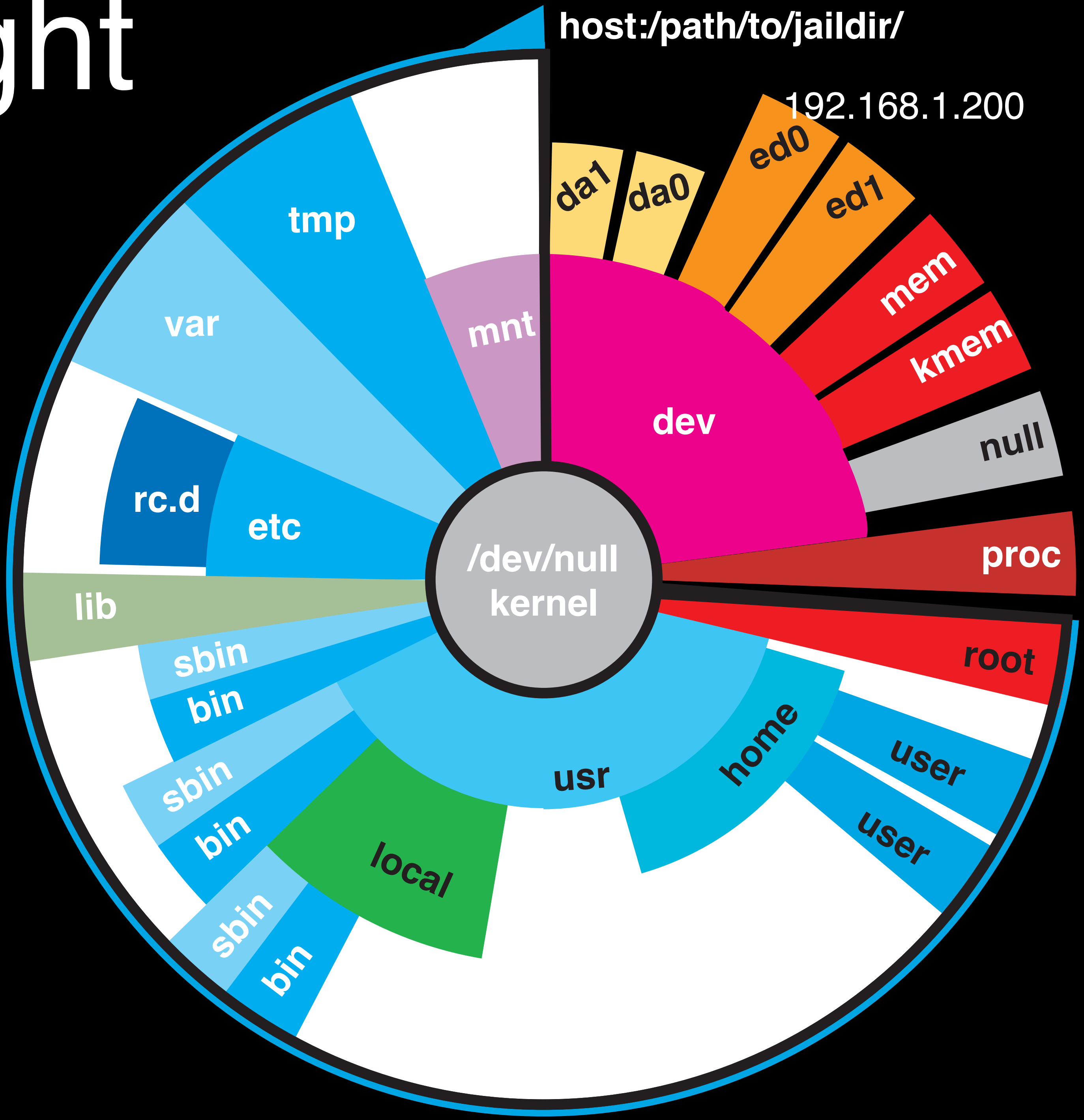

host:/path/to/jaildir/
re0
/dev/null
kernel
mnt
tmp
var
etc
rc.d
lib
sbin
bin
usr
sbin
bin
local
sbin
bin
home
user
user
root
dev
da1
da0
ed0
ed1
mem
kmem
null

preflight

re0

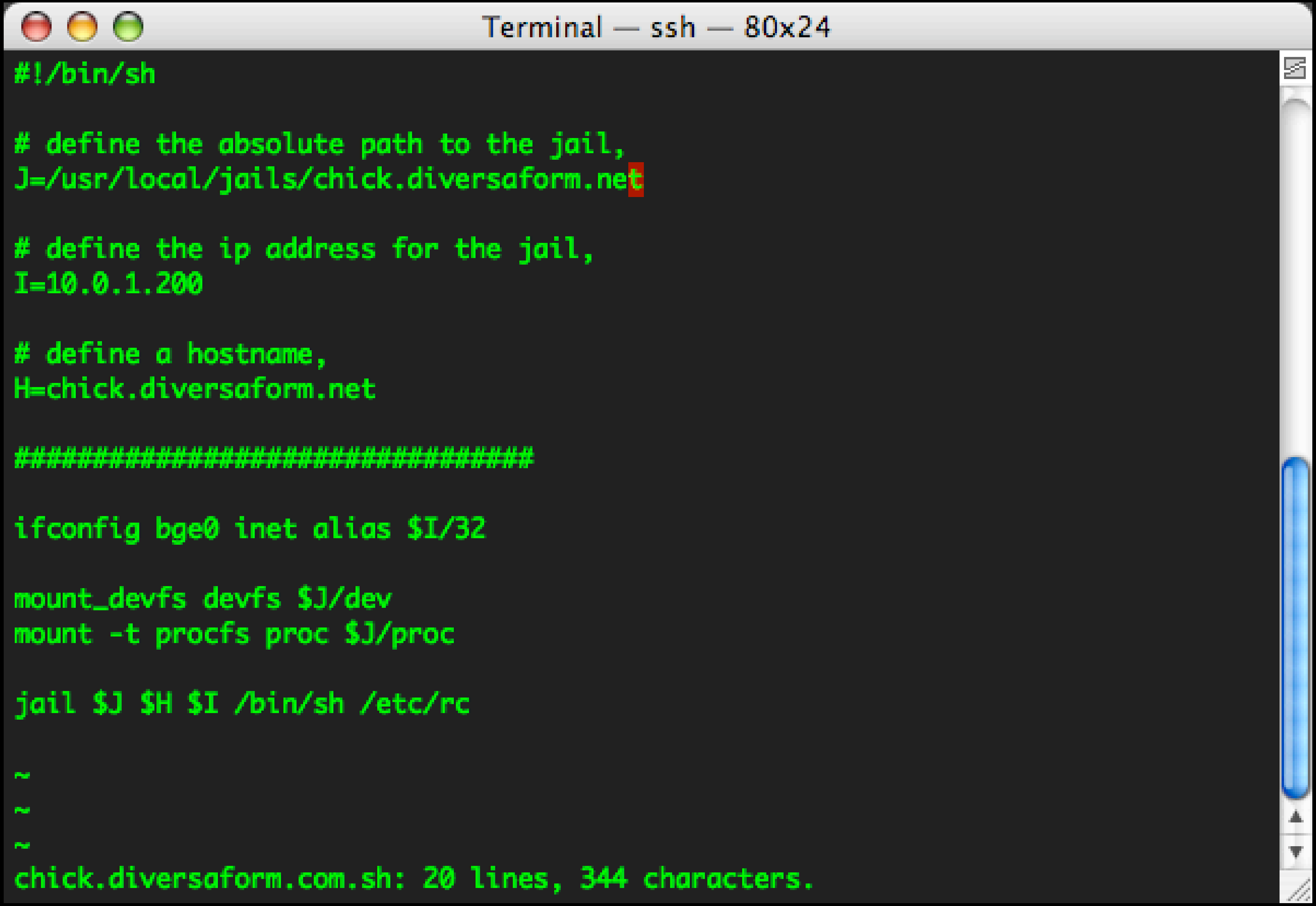
192.168.1.2

192.168.1.200
192.168.1.x



start tangent! (script),

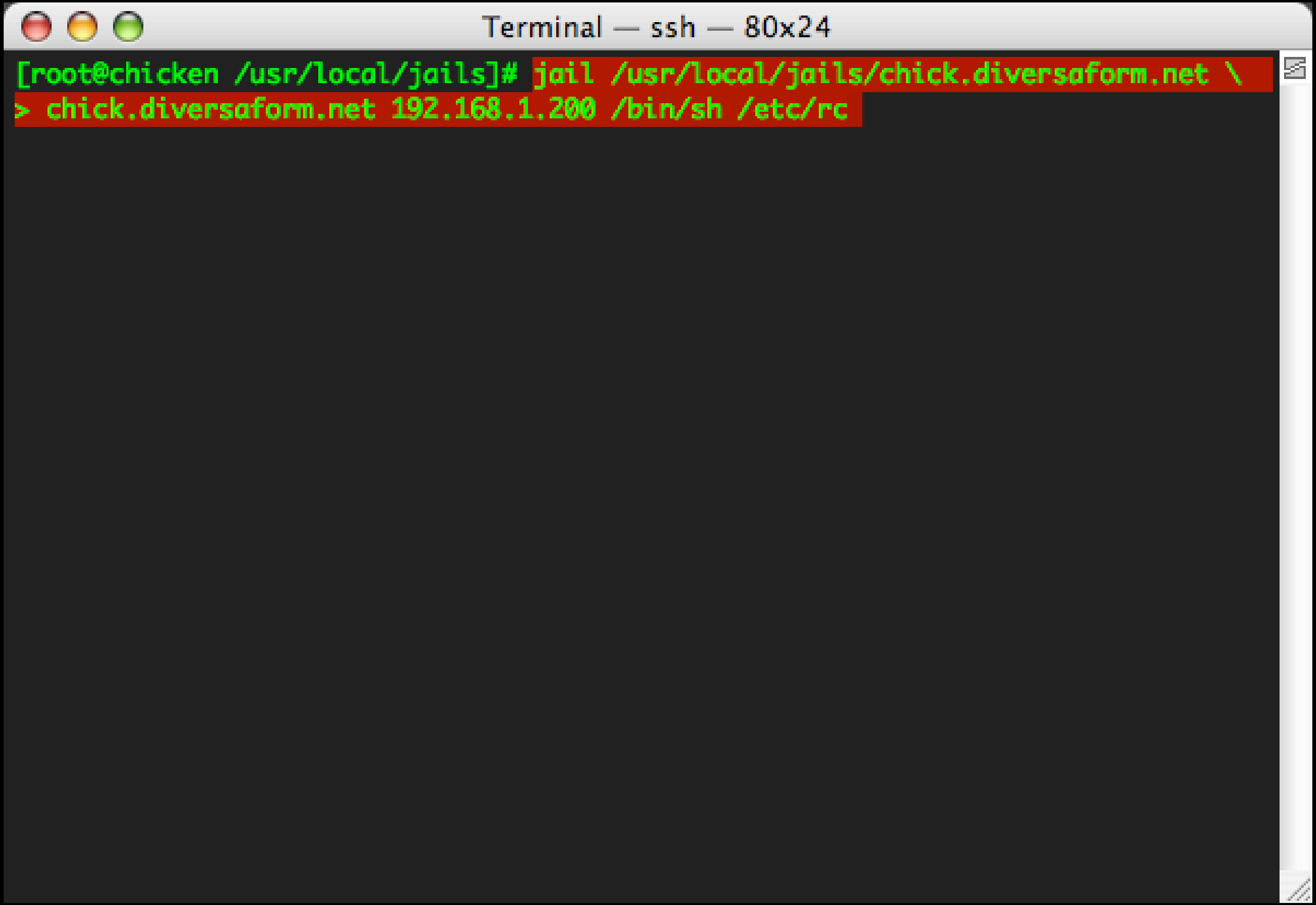
remember how I said rc.d is usually a bad idea?



```
#!/bin/sh

# define the absolute path to the jail,
J=/usr/local/jails/chick.diversaform.net

# define the ip address for the jail,
I=10.0.1.200

# define a hostname,
H=chick.diversaform.net

#################################

ifconfig bge0 inet alias $I/32

mount_devfs devfs $J/dev
mount -t procfs proc $J/proc

jail $J $H $I /bin/sh /etc/rc

~
~
~
chick.diversaform.com.sh: 20 lines, 344 characters.
```

start!

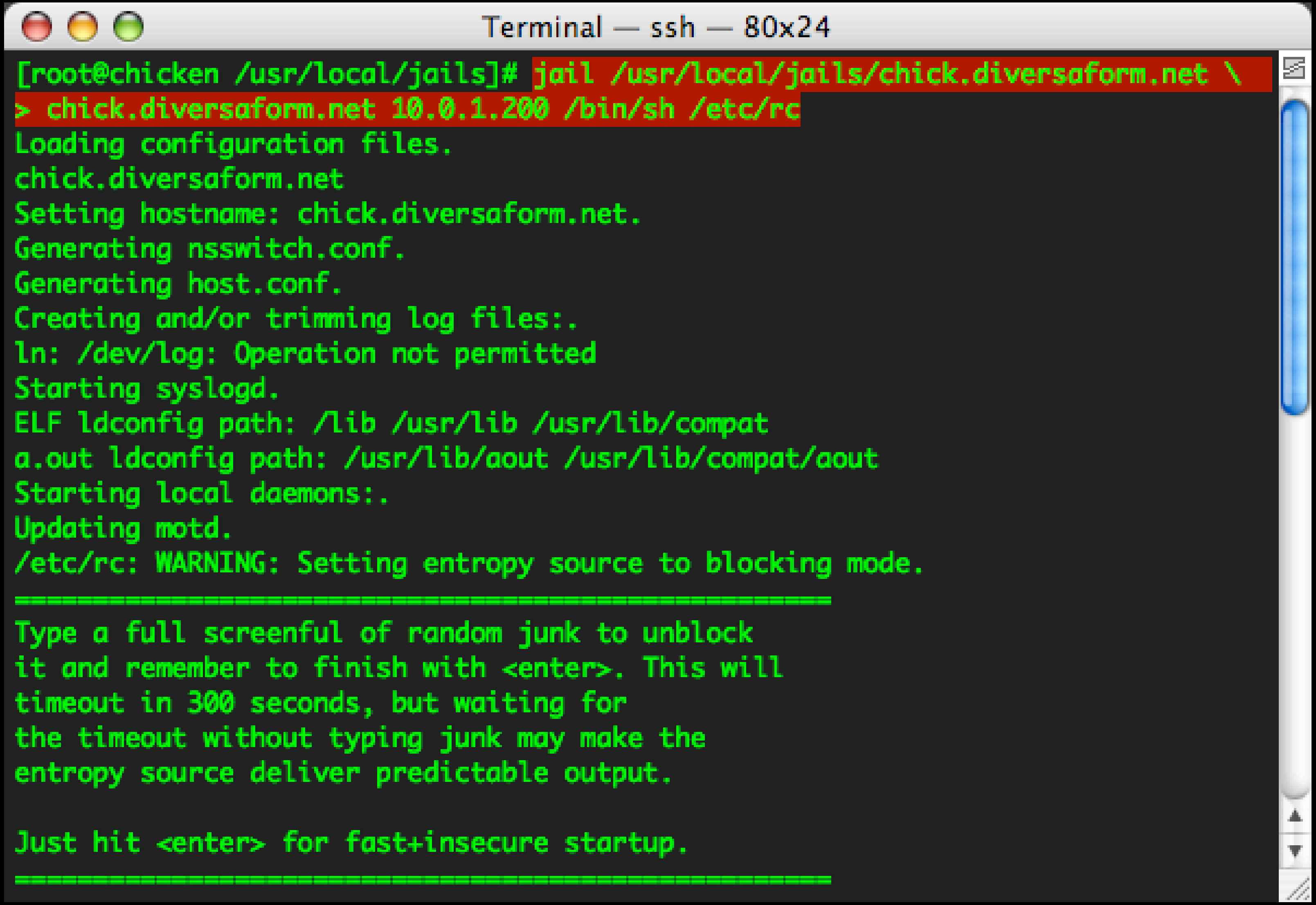
we’re gonna start the jail manually here....



```
[root@chicken /usr/local/jails]# jail /usr/local/jails/chick.diversaform.net \
> chick.diversaform.net 192.168.1.200 /bin/sh /etc/rc
```

start!

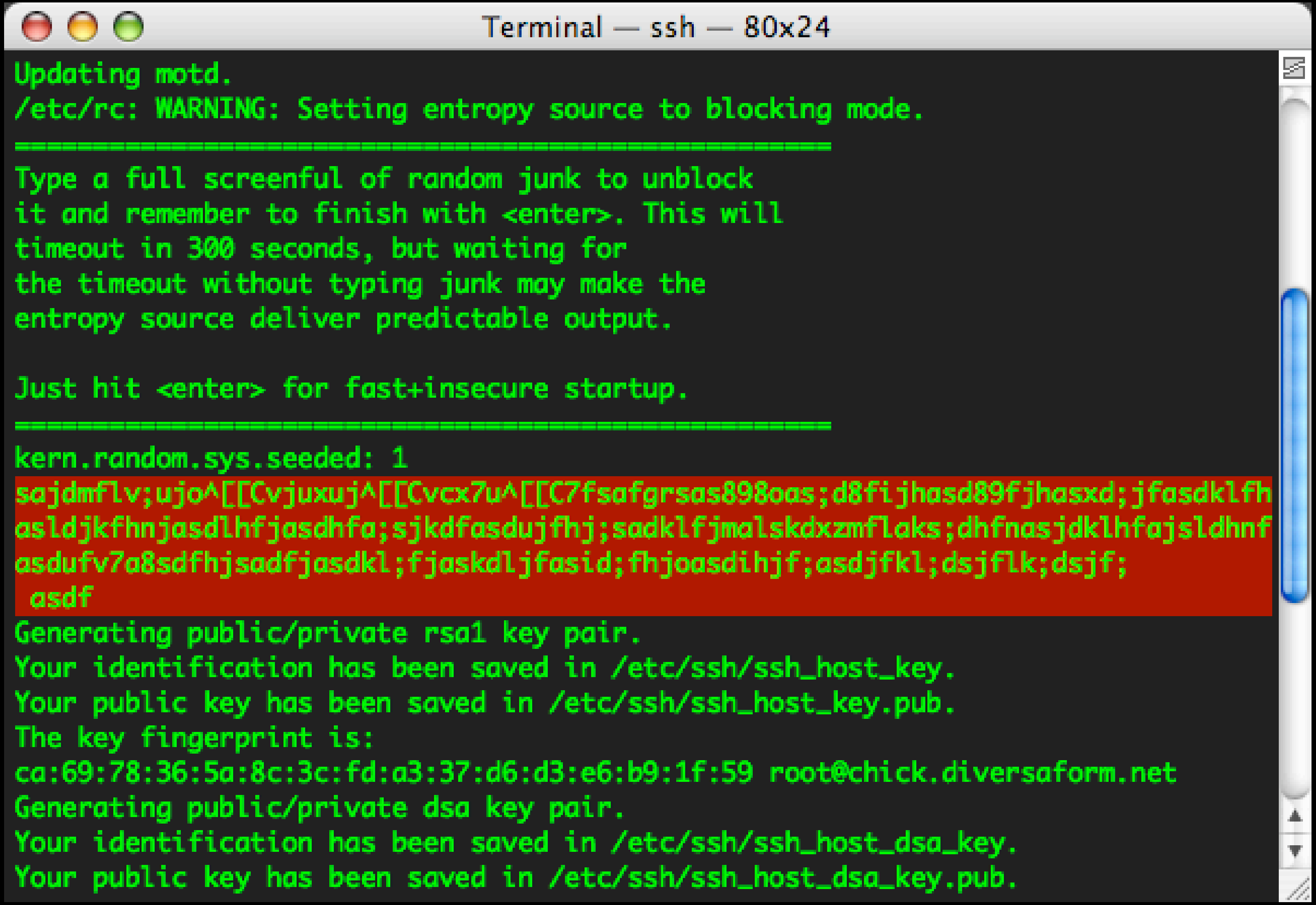
we're gonna start the jail manually here....



```
[root@chicken /usr/local/jails]# jail /usr/local/jails/chick.diversaform.net \
> chick.diversaform.net 10.0.1.200 /bin/sh /etc/rc
Loading configuration files.
chick.diversaform.net
Setting hostname: chick.diversaform.net.
Generating nsswitch.conf.
Generating host.conf.
Creating and/or trimming log files:.
ln: /dev/log: Operation not permitted
Starting syslogd.
ELF ldconfig path: /lib /usr/lib /usr/lib/compat
a.out ldconfig path: /usr/lib/aout /usr/lib/compat/aout
Starting local daemons:.
Updating motd.
/etc/rc: WARNING: Setting entropy source to blocking mode.
====================================================
Type a full screenful of random junk to unblock
it and remember to finish with <enter>. This will
timeout in 300 seconds, but waiting for
the timeout without typing junk may make the
entropy source deliver predictable output.

Just hit <enter> for fast+insecure startup.
====================================================
```

start!

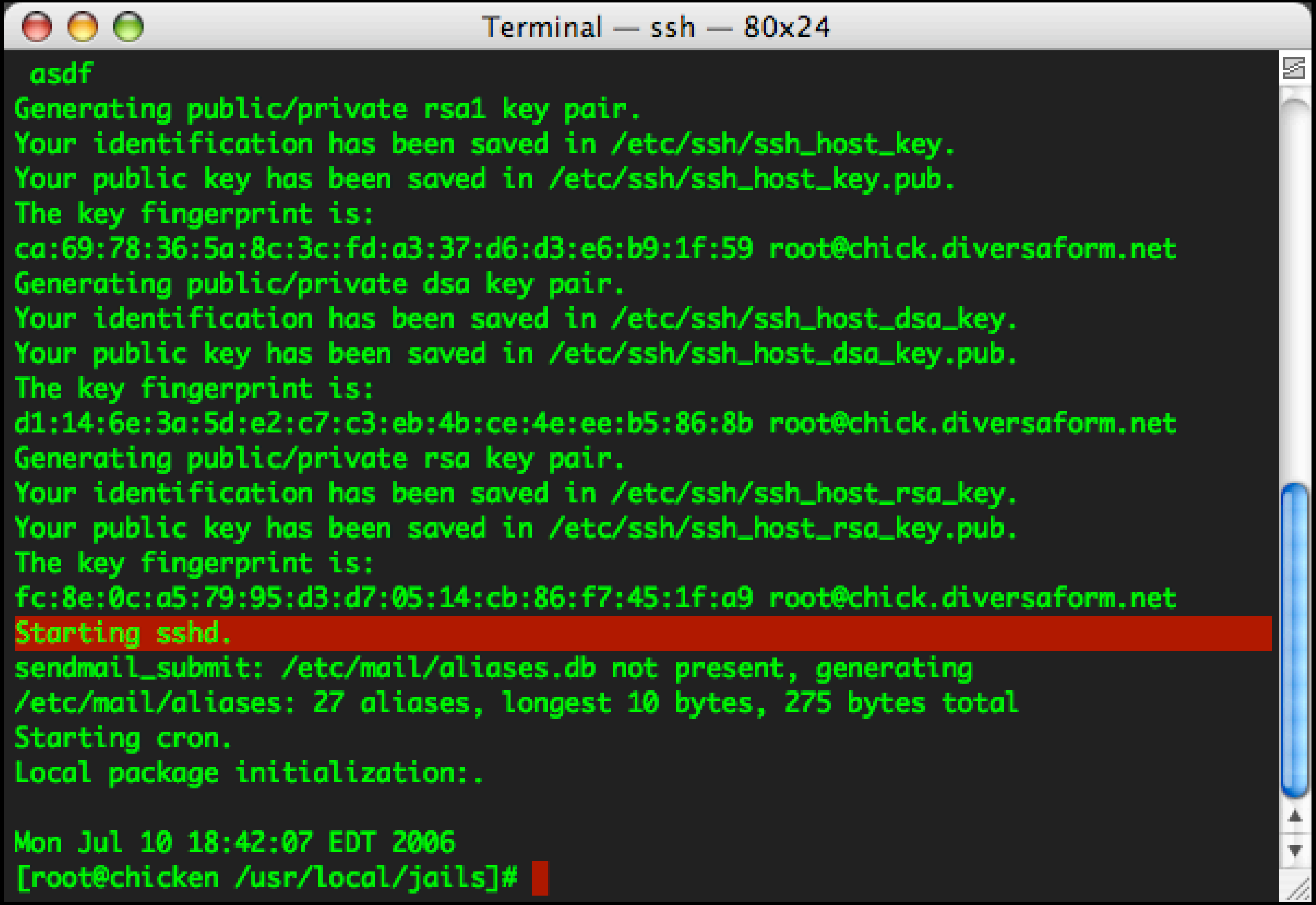
type some random junk to seed entropy,



```
Updating motd.
/etc/rc: WARNING: Setting entropy source to blocking mode.
====================================================
Type a full screenful of random junk to unblock
it and remember to finish with <enter>. This will
timeout in 300 seconds, but waiting for
the timeout without typing junk may make the
entropy source deliver predictable output.

Just hit <enter> for fast+insecure startup.
====================================================
kern.random.sys.seeded: 1
sajdmflv;ujo^[[Cvjuxuj^[[Cvcx7u^[[C7fsafgrsas898oas;d8fijhasd89fjhasxd;jfasdklfh
asldjkfhnjasdlhfjasdhfa;sjkdfasdujfhj;sadklfjmalskdxzmflaks;dhfnasjdklhfajsldhnf
asdufv7a8sdfhjsadfjasdkl;fjaskdljfasid;fhjoasdihjf;asdjfkl;dsjflk;dsjf;
 asdf
Generating public/private rsa1 key pair.
Your identification has been saved in /etc/ssh/ssh_host_key.
Your public key has been saved in /etc/ssh/ssh_host_key.pub.
The key fingerprint is:
ca:69:78:36:5a:8c:3c:fd:a3:37:d6:d3:e6:b9:1f:59 root@chick.diversaform.net
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
```

start!

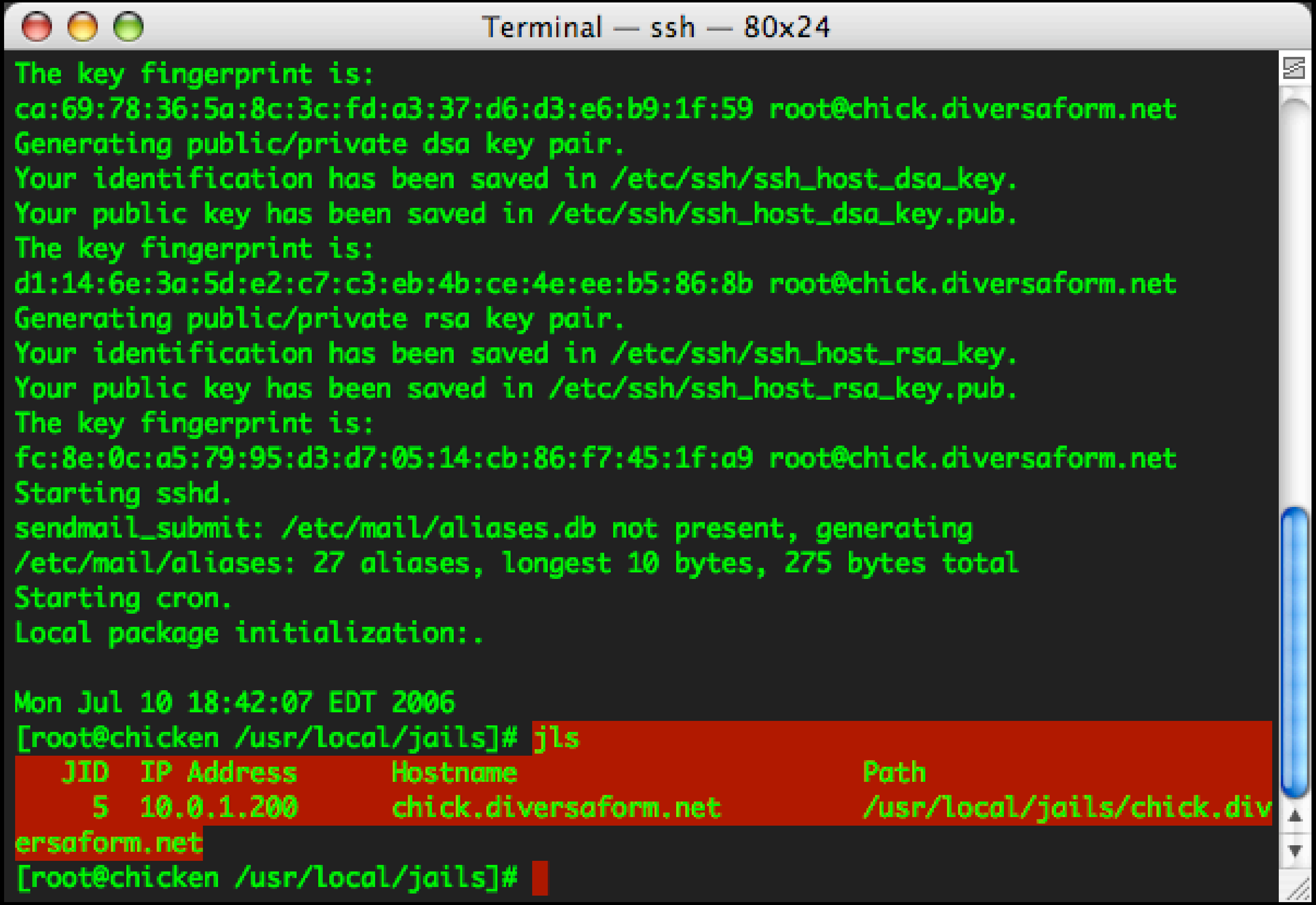
jail finished starting



```
 asdf
Generating public/private rsa1 key pair.
Your identification has been saved in /etc/ssh/ssh_host_key.
Your public key has been saved in /etc/ssh/ssh_host_key.pub.
The key fingerprint is:
ca:69:78:36:5a:8c:3c:fd:a3:37:d6:d3:e6:b9:1f:59 root@chick.diversaform.net
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
d1:14:6e:3a:5d:e2:c7:c3:eb:4b:ce:4e:ee:b5:86:8b root@chick.diversaform.net
Generating public/private rsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_rsa_key.
Your public key has been saved in /etc/ssh/ssh_host_rsa_key.pub.
The key fingerprint is:
fc:8e:0c:a5:79:95:d3:d7:05:14:cb:86:f7:45:1f:a9 root@chick.diversaform.net
Starting sshd.
sendmail_submit: /etc/mail/aliases.db not present, generating
/etc/mail/aliases: 27 aliases, longest 10 bytes, 275 bytes total
Starting cron.
Local package initialization:.

Mon Jul 10 18:42:07 EDT 2006
[root@chicken /usr/local/jails]# 
```

running

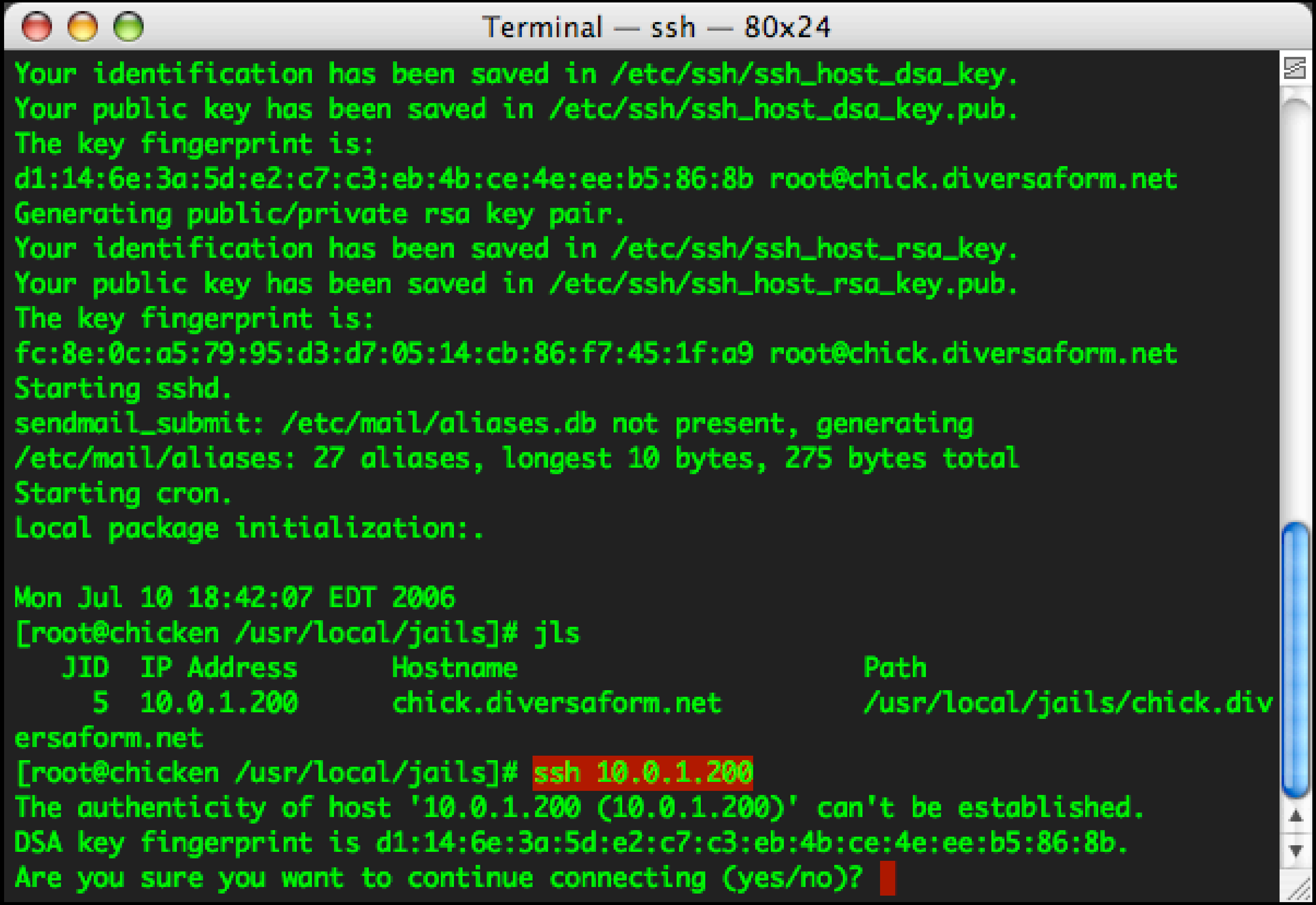
jls(8) lists running jails, gives a jail ID



```
The key fingerprint is:
ca:69:78:36:5a:8c:3c:fd:a3:37:d6:d3:e6:b9:1f:59 root@chick.diversaform.net
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
d1:14:6e:3a:5d:e2:c7:c3:eb:4b:ce:4e:ee:b5:86:8b root@chick.diversaform.net
Generating public/private rsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_rsa_key.
Your public key has been saved in /etc/ssh/ssh_host_rsa_key.pub.
The key fingerprint is:
fc:8e:0c:a5:79:95:d3:d7:05:14:cb:86:f7:45:1f:a9 root@chick.diversaform.net
Starting sshd.
sendmail_submit: /etc/mail/aliases.db not present, generating
/etc/mail/aliases: 27 aliases, longest 10 bytes, 275 bytes total
Starting cron.
Local package initialization:.

Mon Jul 10 18:42:07 EDT 2006
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# 
```

using the jail

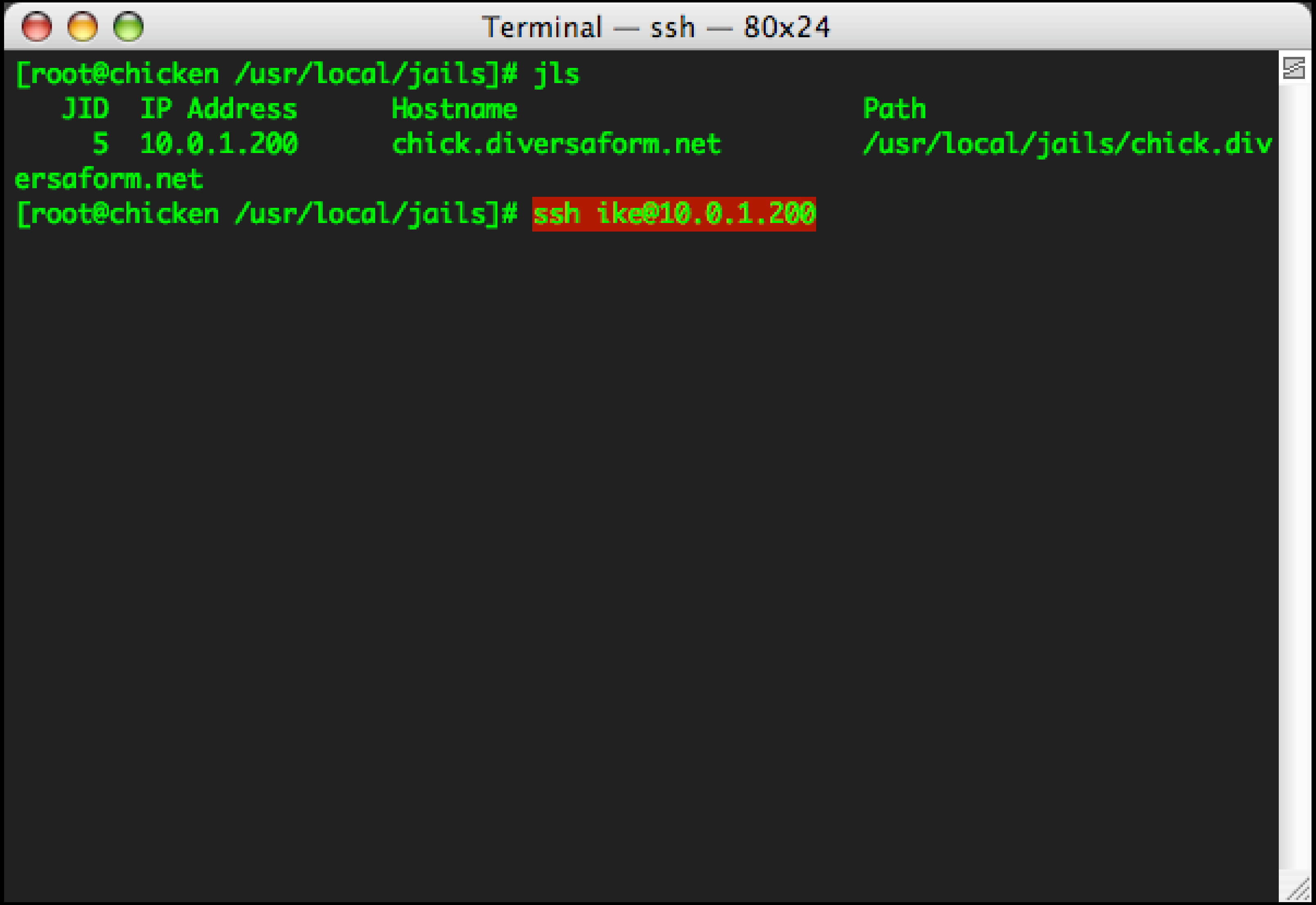
ssh into the jail, treat it like a server.



```
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
d1:14:6e:3a:5d:e2:c7:c3:eb:4b:ce:4e:ee:b5:86:8b root@chick.diversaform.net
Generating public/private rsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_rsa_key.
Your public key has been saved in /etc/ssh/ssh_host_rsa_key.pub.
The key fingerprint is:
fc:8e:0c:a5:79:95:d3:d7:05:14:cb:86:f7:45:1f:a9 root@chick.diversaform.net
Starting sshd.
sendmail_submit: /etc/mail/aliases.db not present, generating
/etc/mail/aliases: 27 aliases, longest 10 bytes, 275 bytes total
Starting cron.
Local package initialization:.

Mon Jul 10 18:42:07 EDT 2006
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# ssh 10.0.1.200
The authenticity of host '10.0.1.200 (10.0.1.200)' can't be established.
DSA key fingerprint is d1:14:6e:3a:5d:e2:c7:c3:eb:4b:ce:4e:ee:b5:86:8b.
Are you sure you want to continue connecting (yes/no)?
```

using the jail

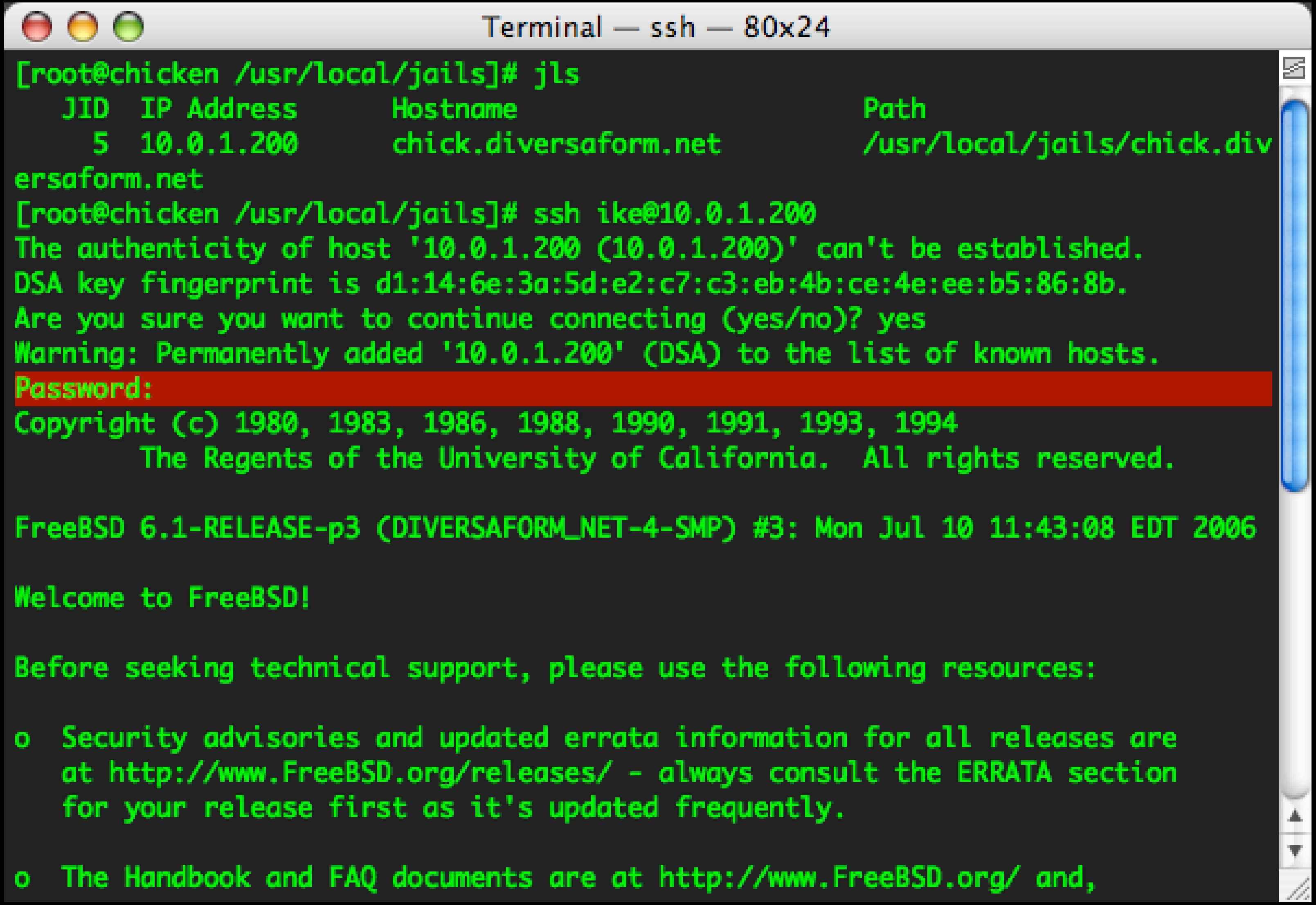
ssh into the jail, treat it like a server.



```
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# ssh ike@10.0.1.200
```

using the jail

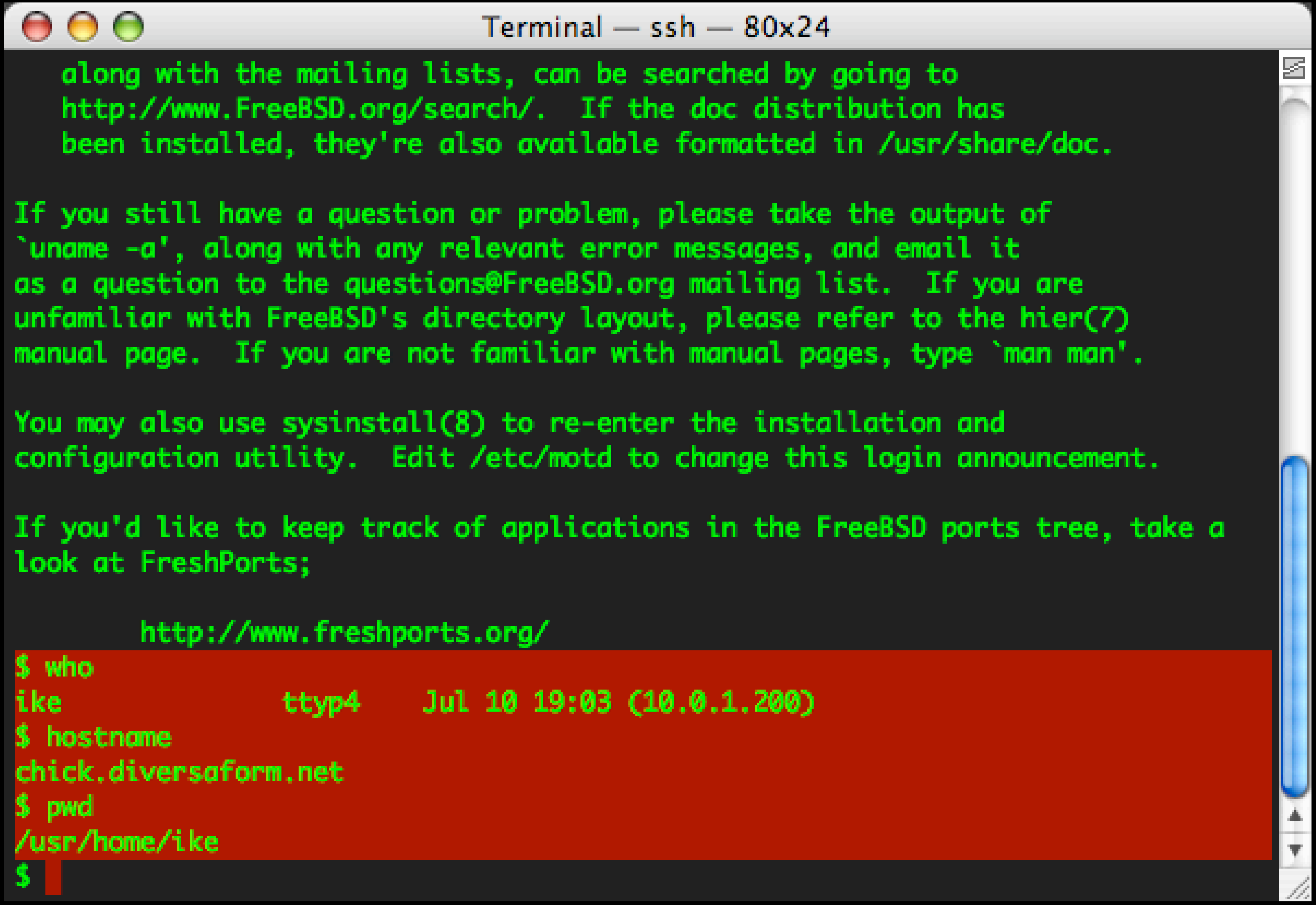
ssh into the jail, treat it like a server.



```
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# ssh ike@10.0.1.200
The authenticity of host '10.0.1.200 (10.0.1.200)' can't be established.
DSA key fingerprint is d1:14:6e:3a:5d:e2:c7:c3:eb:4b:ce:4e:ee:b5:86:8b.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.1.200' (DSA) to the list of known hosts.
Password:
Copyright (c) 1980, 1983, 1986, 1988, 1990, 1991, 1993, 1994
        The Regents of the University of California.  All rights reserved.

FreeBSD 6.1-RELEASE-p3 (DIVERSAFORM_NET-4-SMP) #3: Mon Jul 10 11:43:08 EDT 2006

Welcome to FreeBSD!

Before seeking technical support, please use the following resources:

o  Security advisories and updated errata information for all releases are
   at http://www.FreeBSD.org/releases/ - always consult the ERRATA section
   for your release first as it's updated frequently.

o  The Handbook and FAQ documents are at http://www.FreeBSD.org/ and,
```

inside the jail

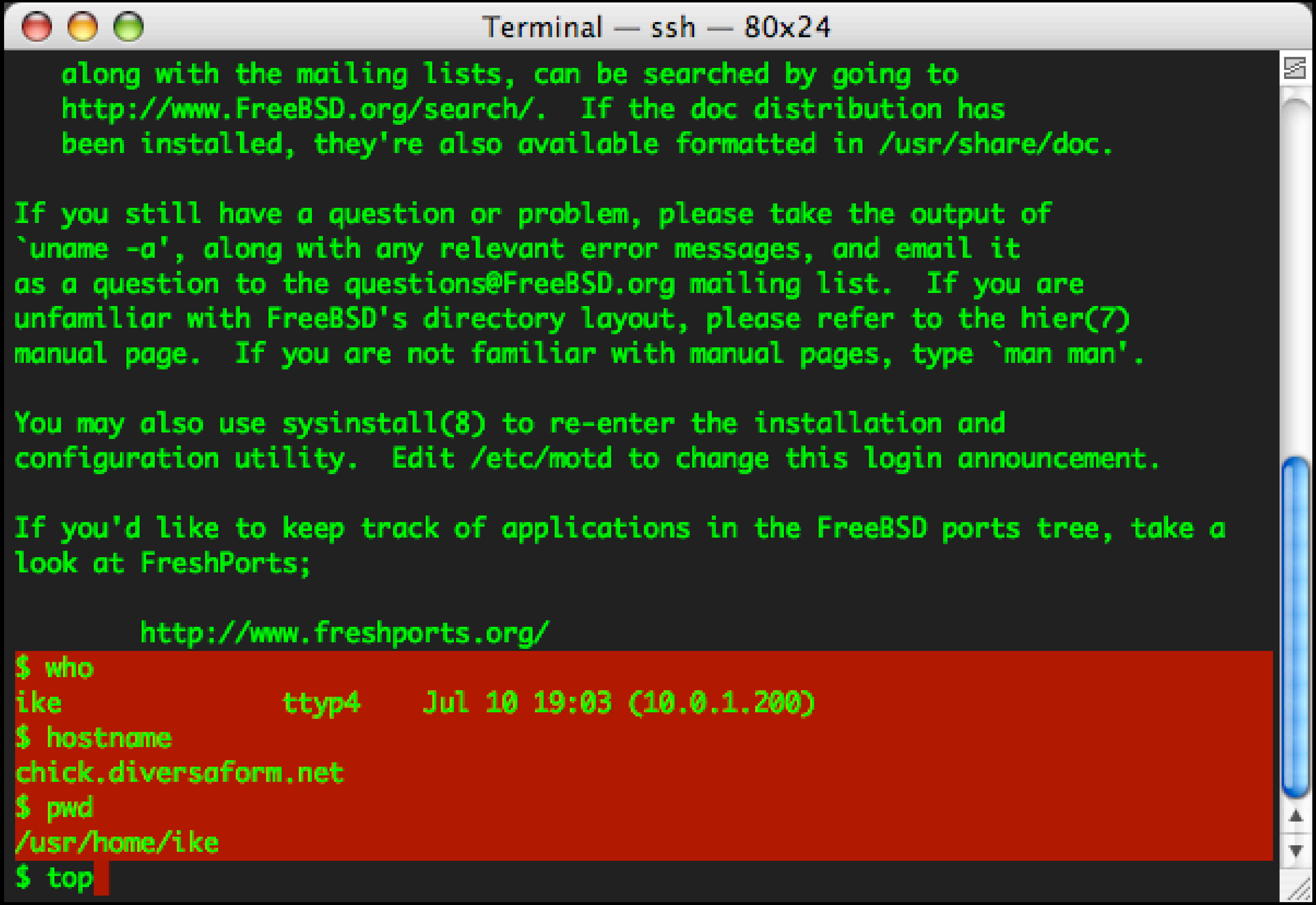
just like any new server



```
   along with the mailing lists, can be searched by going to
   http://www.FreeBSD.org/search/.  If the doc distribution has
   been installed, they're also available formatted in /usr/share/doc.

If you still have a question or problem, please take the output of
`uname -a', along with any relevant error messages, and email it
as a question to the questions@FreeBSD.org mailing list.  If you are
unfamiliar with FreeBSD's directory layout, please refer to the hier(7)
manual page.  If you are not familiar with manual pages, type `man man'.

You may also use sysinstall(8) to re-enter the installation and
configuration utility.  Edit /etc/motd to change this login announcement.

If you'd like to keep track of applications in the FreeBSD ports tree, take a
look at FreshPorts;

        http://www.freshports.org/
$ who
ike              ttyp4    Jul 10 19:03 (10.0.1.200)
$ hostname
chick.diversaform.net
$ pwd
/usr/home/ike
$ 
```

inside the jail

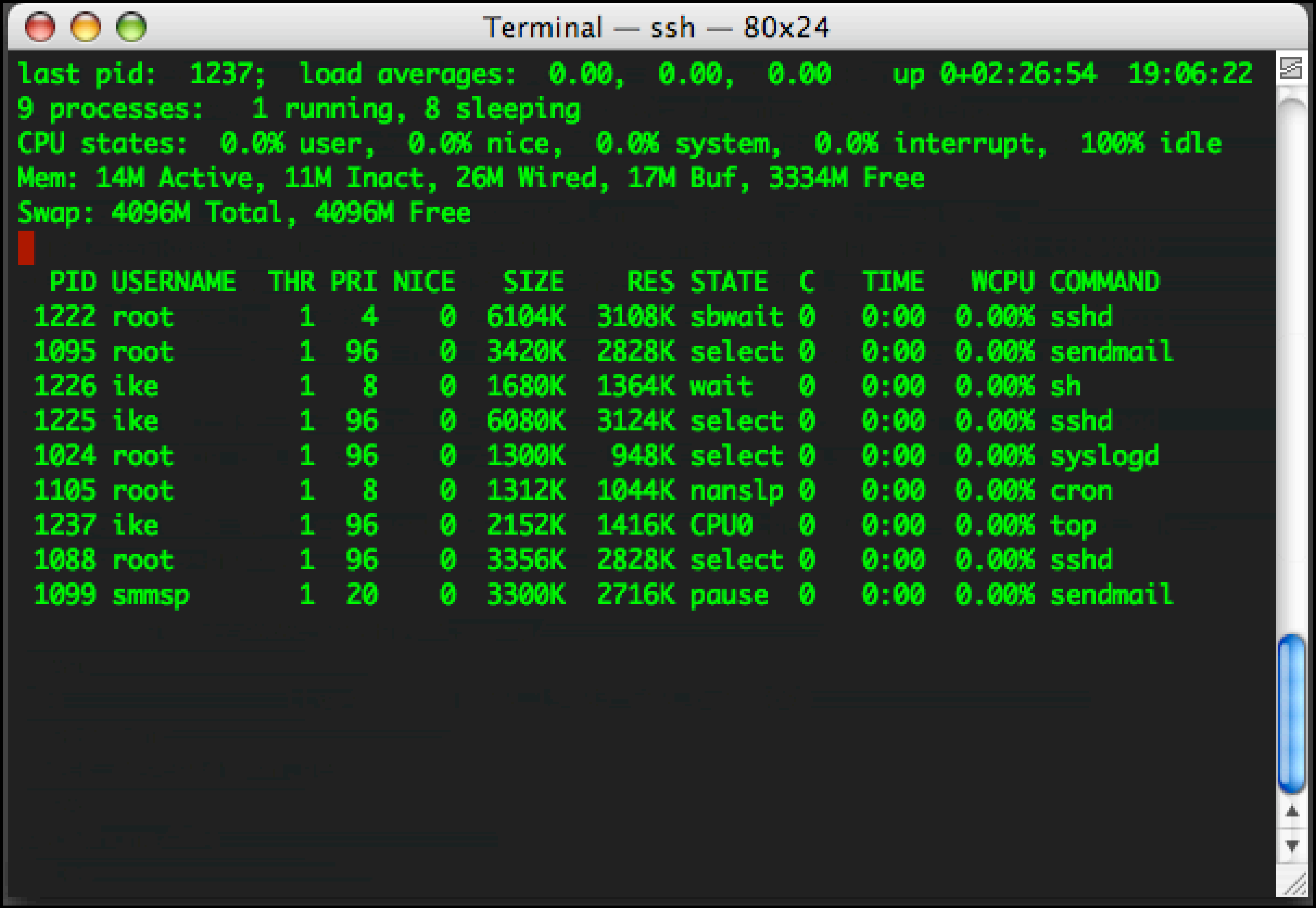
just like any new server



```
   along with the mailing lists, can be searched by going to
   http://www.FreeBSD.org/search/.  If the doc distribution has
   been installed, they're also available formatted in /usr/share/doc.

If you still have a question or problem, please take the output of
`uname -a', along with any relevant error messages, and email it
as a question to the questions@FreeBSD.org mailing list.  If you are
unfamiliar with FreeBSD's directory layout, please refer to the hier(7)
manual page.  If you are not familiar with manual pages, type `man man'.

You may also use sysinstall(8) to re-enter the installation and
configuration utility.  Edit /etc/motd to change this login announcement.

If you'd like to keep track of applications in the FreeBSD ports tree, take a
look at FreshPorts;

        http://www.freshports.org/
$ who
ike              ttyp4    Jul 10 19:03 (10.0.1.200)
$ hostname
chick.diversaform.net
$ pwd
/usr/home/ike
$ top
```

inside the jail

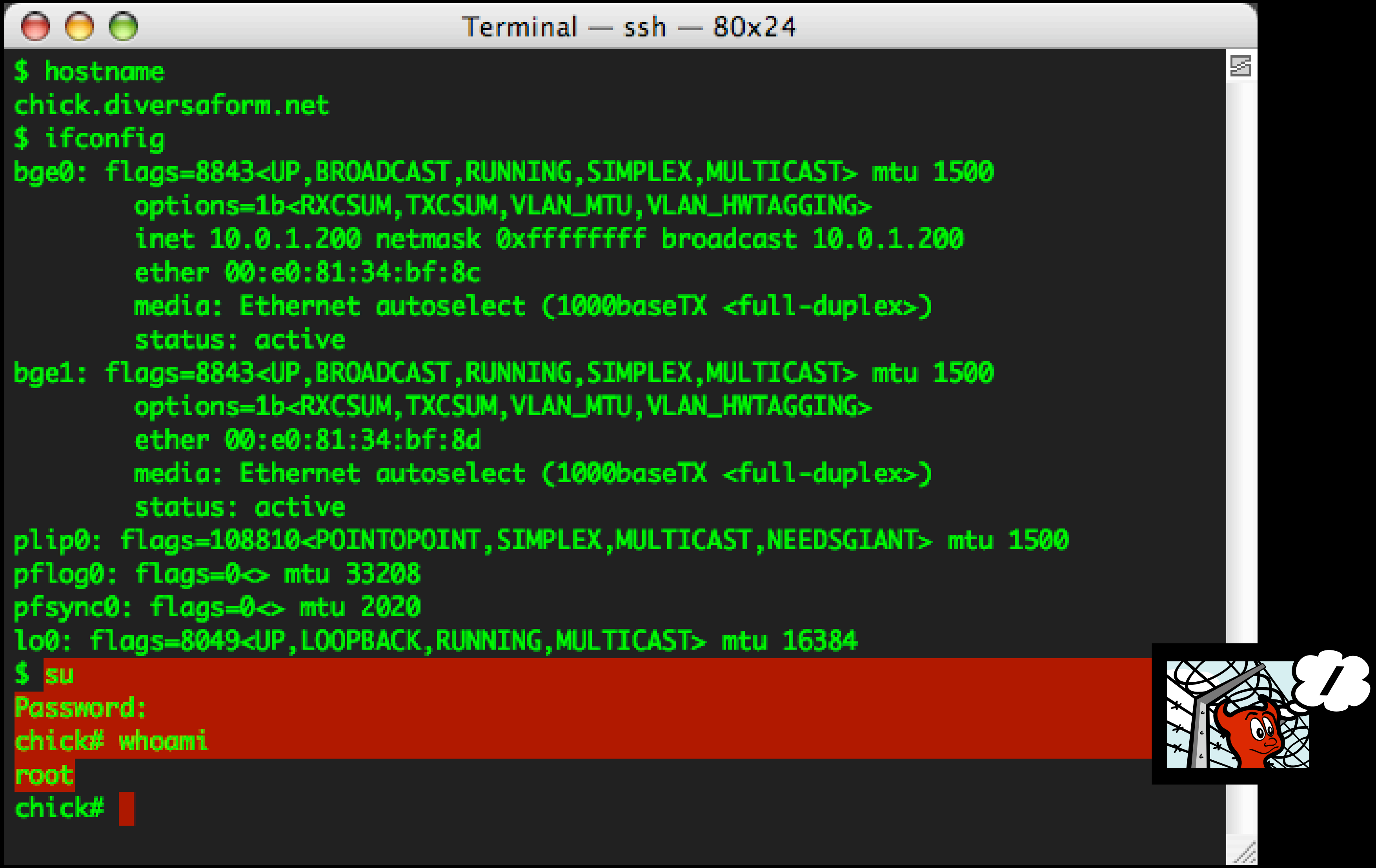
just like any new server



```
last pid:  1237;  load averages:  0.00,  0.00,  0.00    up 0+02:26:54  19:06:22
9 processes:   1 running, 8 sleeping
CPU states:  0.0% user,  0.0% nice,  0.0% system,  0.0% interrupt,  100% idle
Mem: 14M Active, 11M Inact, 26M Wired, 17M Buf, 3334M Free
Swap: 4096M Total, 4096M Free

  PID USERNAME  THR PRI NICE   SIZE    RES STATE  C   TIME   WCPU COMMAND
 1222 root        1   4    0  6104K  3108K sbwait 0   0:00  0.00% sshd
 1095 root        1  96    0  3420K  2828K select 0   0:00  0.00% sendmail
 1226 ike         1   8    0  1680K  1364K wait   0   0:00  0.00% sh
 1225 ike         1  96    0  6080K  3124K select 0   0:00  0.00% sshd
 1024 root        1  96    0  1300K   948K select 0   0:00  0.00% syslogd
 1105 root        1   8    0  1312K  1044K nanslp 0   0:00  0.00% cron
 1237 ike         1  96    0  2152K  1416K CPU0   0   0:00  0.00% top
 1088 root        1  96    0  3356K  2828K select 0   0:00  0.00% sshd
 1099 smmsp       1  20    0  3300K  2716K pause  0   0:00  0.00% sendmail
```

inside the jail

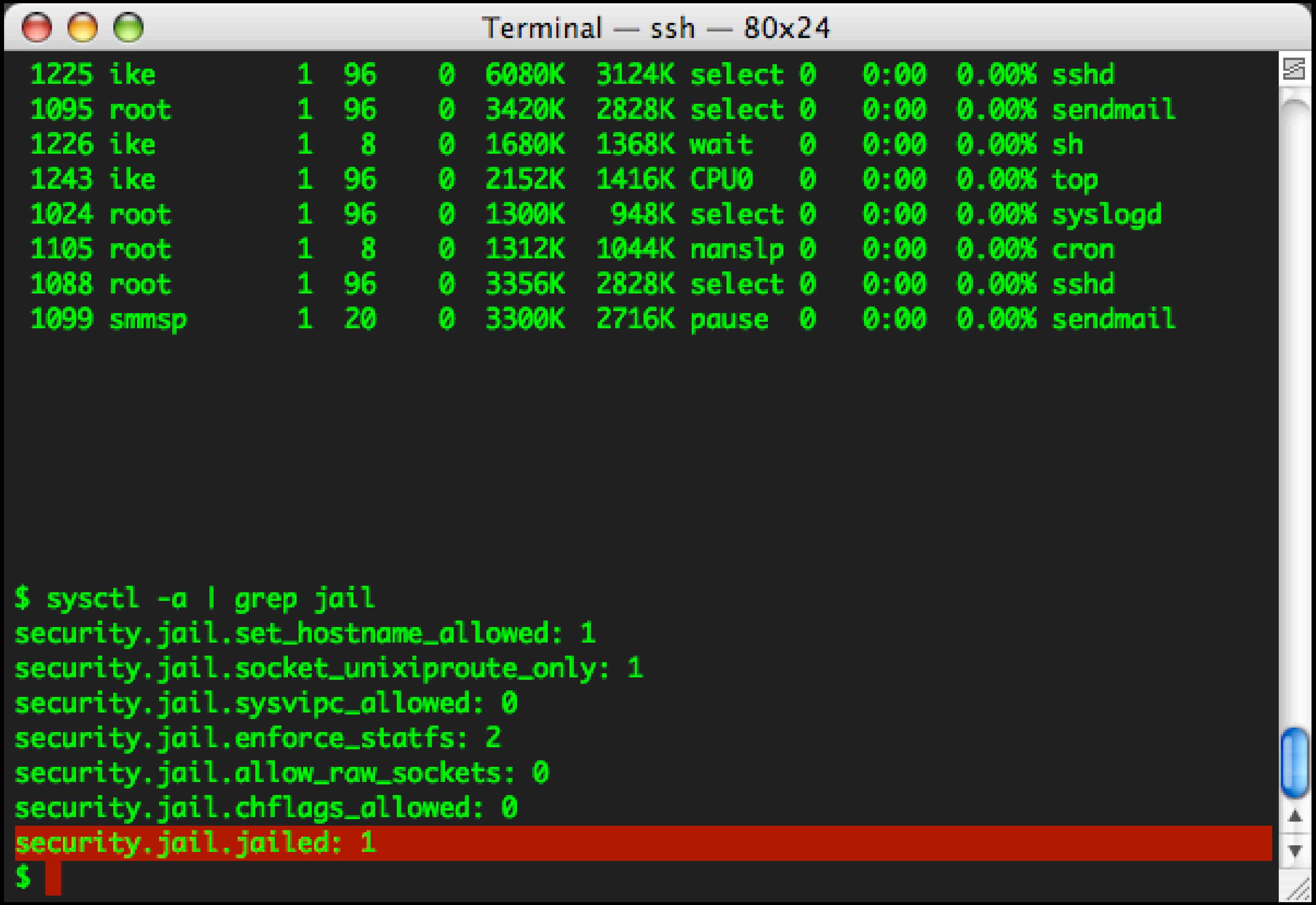
you have root!



```
$ hostname
chick.diversaform.net
$ ifconfig
bge0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=1b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING>
        inet 10.0.1.200 netmask 0xffffffff broadcast 10.0.1.200
        ether 00:e0:81:34:bf:8c
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
bge1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=1b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING>
        ether 00:e0:81:34:bf:8d
        media: Ethernet autoselect (1000baseTX <full-duplex>)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> mtu 1500
pflog0: flags=0<> mtu 33208
pfsync0: flags=0<> mtu 2020
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
$ su
Password:
chick# whoami
root
chick# 
```

inside the jail

how do you know you are inside a jail?

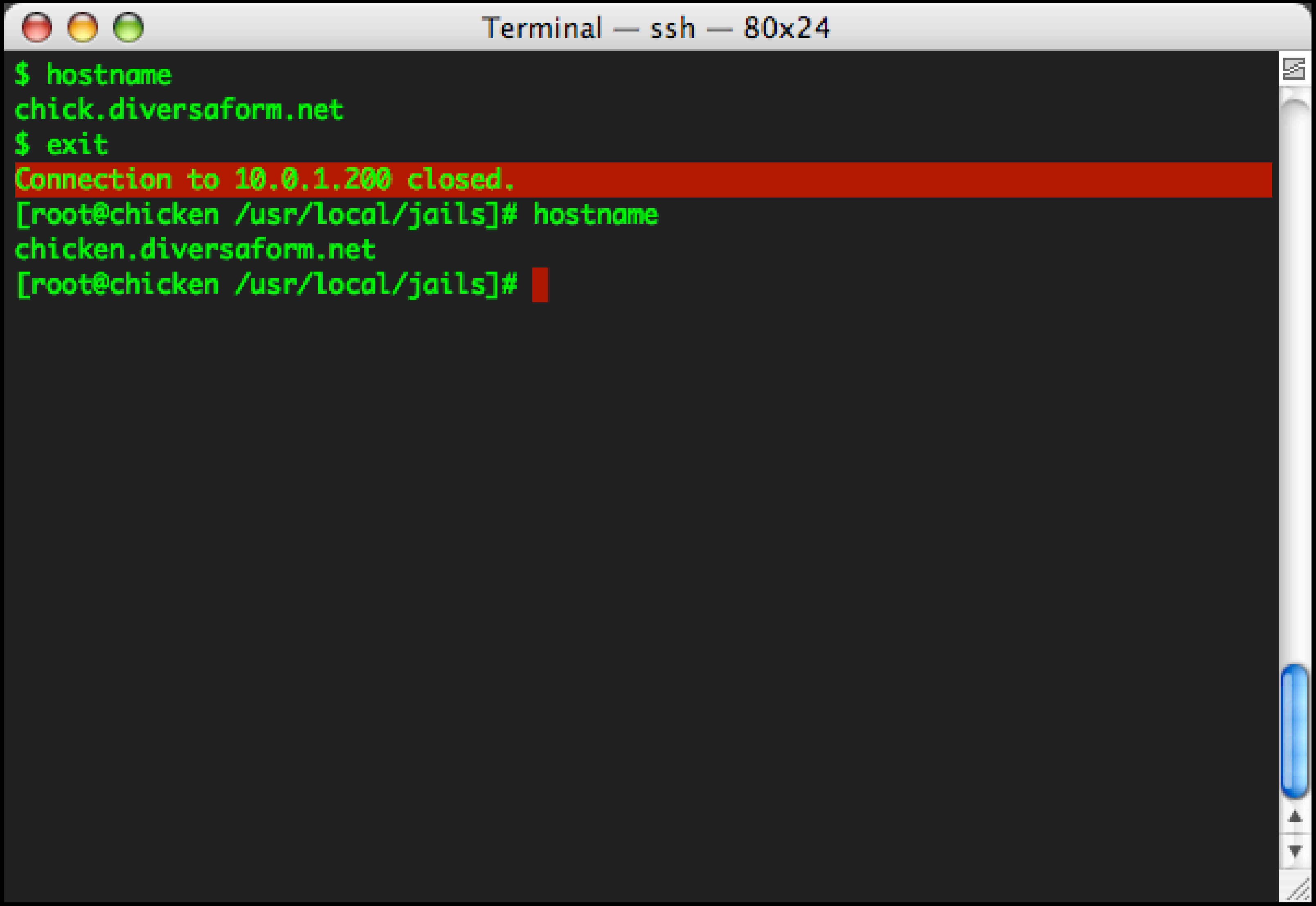


```
 1225 ike          1  96    0  6080K 3124K select 0   0:00  0.00% sshd
 1095 root         1  96    0  3420K 2828K select 0   0:00  0.00% sendmail
 1226 ike          1   8    0  1680K 1368K wait   0   0:00  0.00% sh
 1243 ike          1  96    0  2152K 1416K CPU0   0   0:00  0.00% top
 1024 root         1  96    0  1300K  948K select 0   0:00  0.00% syslogd
 1105 root         1   8    0  1312K 1044K nanslp 0   0:00  0.00% cron
 1088 root         1  96    0  3356K 2828K select 0   0:00  0.00% sshd
 1099 smmsp        1  20    0  3300K 2716K pause  0   0:00  0.00% sendmail








$ sysctl -a | grep jail
security.jail.set_hostname_allowed: 1
security.jail.socket_unixiproute_only: 1
security.jail.sysvipc_allowed: 0
security.jail.enforce_statfs: 2
security.jail.allow_raw_sockets: 0
security.jail.chflags_allowed: 0
security.jail.jailed: 1
$ 
```

http://www.freebsd.org/cgi/query-pr.cgi?pr=95977 - will explain this url later...

stop and start jail

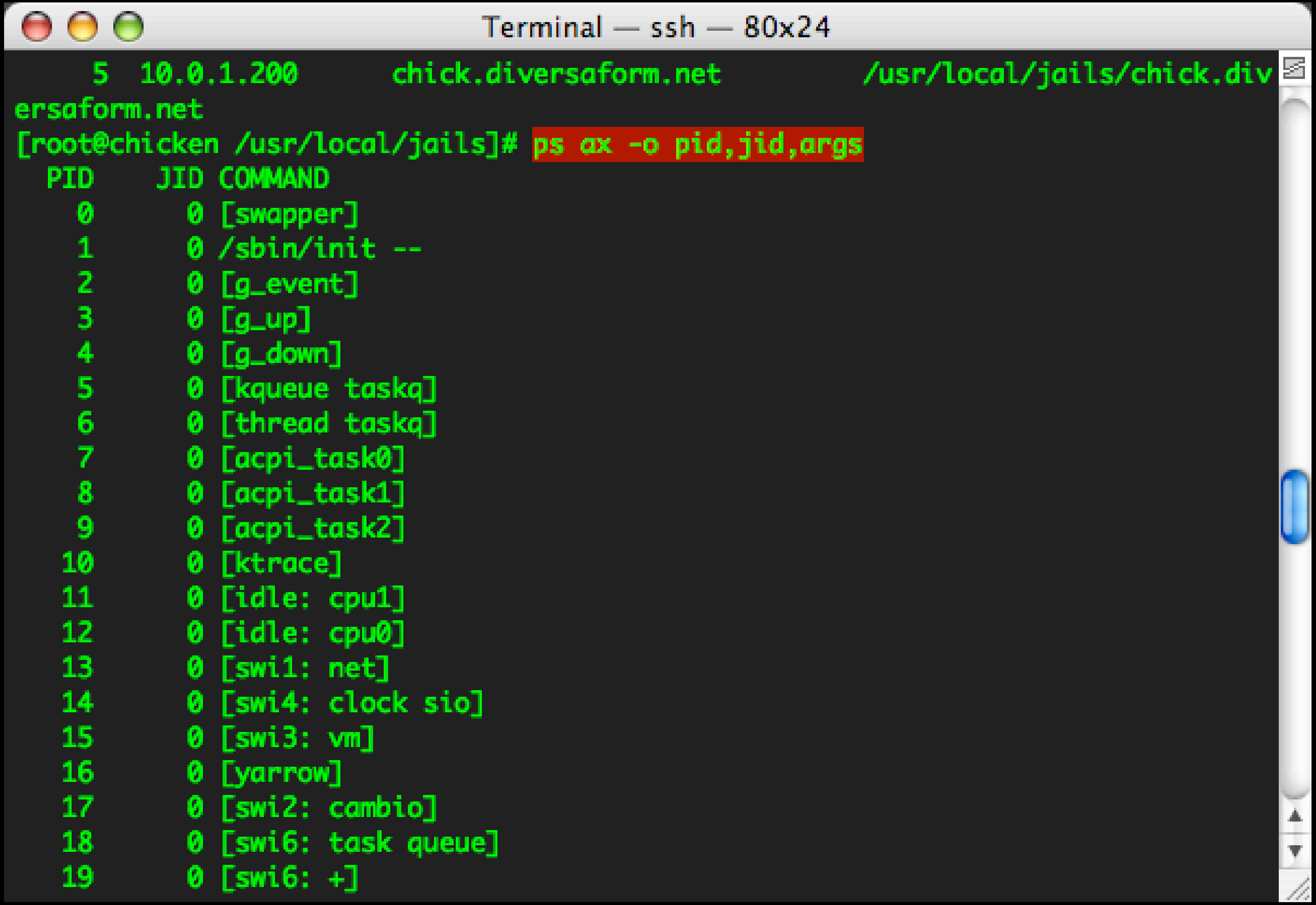
exit the jail, (ssh)



```
$ hostname
chick.diversaform.net
$ exit
Connection to 10.0.1.200 closed.
[root@chicken /usr/local/jails]# hostname
chicken.diversaform.net
[root@chicken /usr/local/jails]#
```

stop and start jail

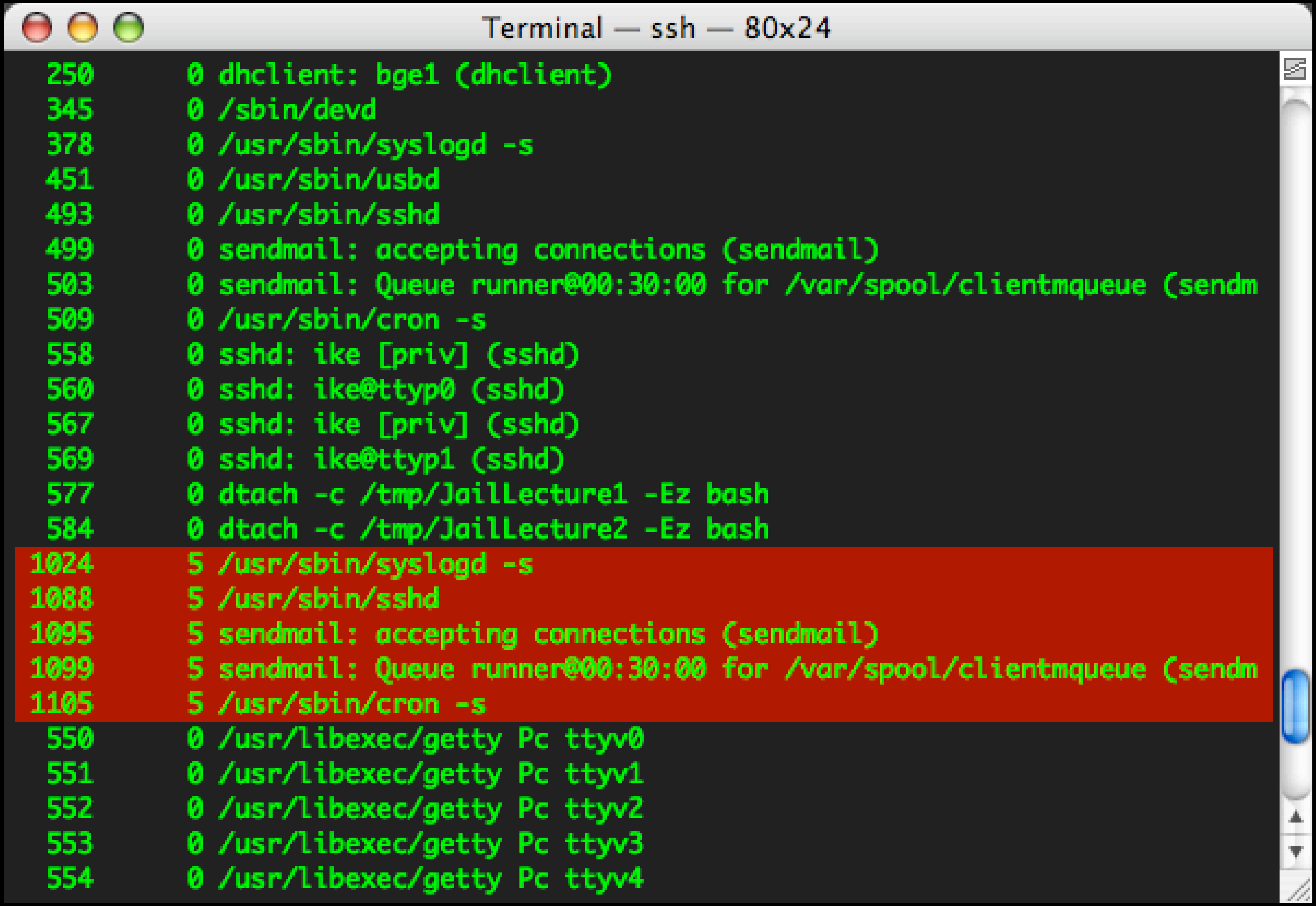
look at jailed processes (man page goodies)



```
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# ps ax -o pid,jid,args
  PID    JID COMMAND
    0      0 [swapper]
    1      0 /sbin/init --
    2      0 [g_event]
    3      0 [g_up]
    4      0 [g_down]
    5      0 [kqueue taskq]
    6      0 [thread taskq]
    7      0 [acpi_task0]
    8      0 [acpi_task1]
    9      0 [acpi_task2]
   10      0 [ktrace]
   11      0 [idle: cpu1]
   12      0 [idle: cpu0]
   13      0 [swi1: net]
   14      0 [swi4: clock sio]
   15      0 [swi3: vm]
   16      0 [yarrow]
   17      0 [swi2: cambio]
   18      0 [swi6: task queue]
   19      0 [swi6: +]
```

stop and start jail

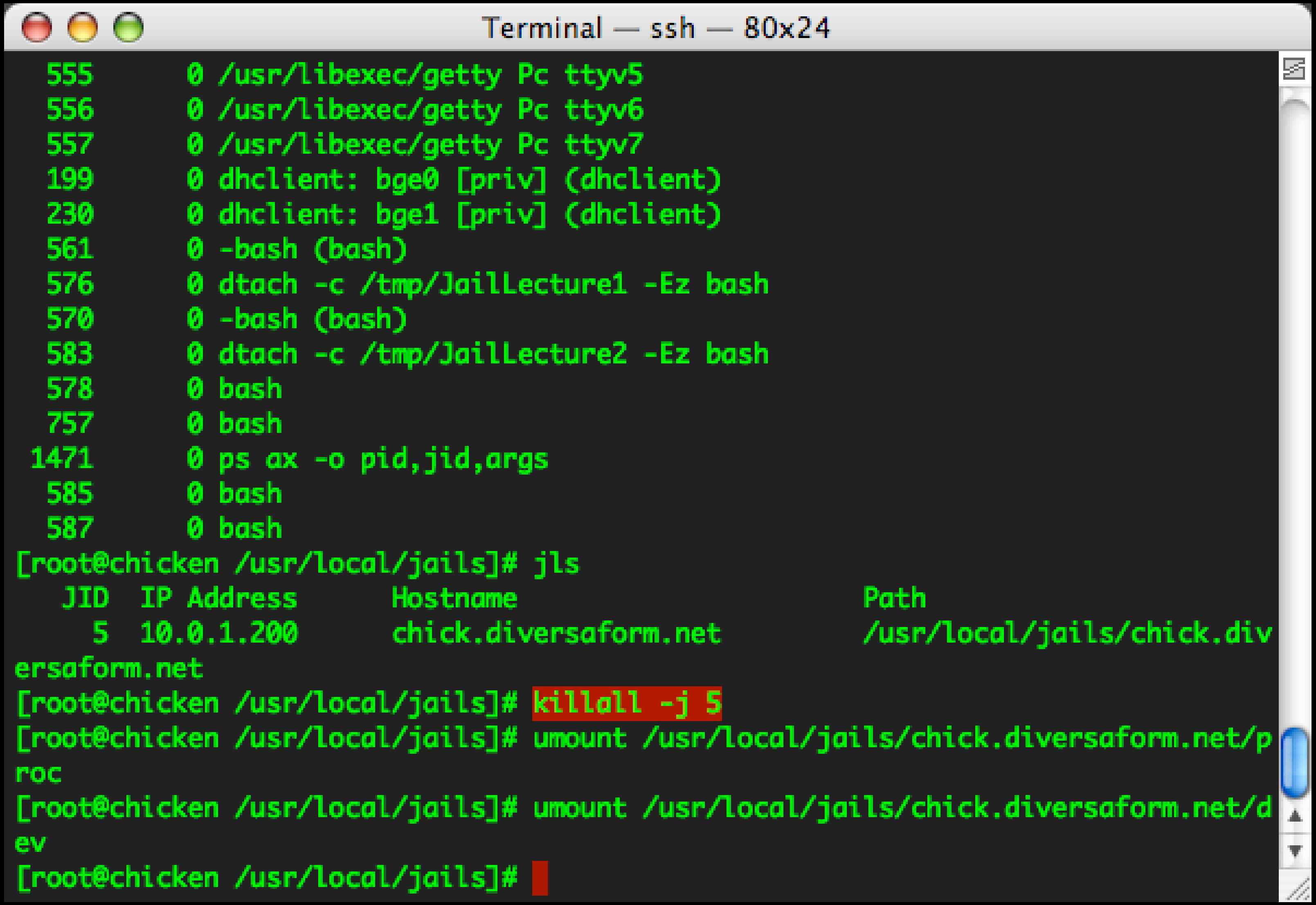
look at jailed processes (man page goodies)



```
  250       0 dhclient: bge1 (dhclient)
  345       0 /sbin/devd
  378       0 /usr/sbin/syslogd -s
  451       0 /usr/sbin/usbd
  493       0 /usr/sbin/sshd
  499       0 sendmail: accepting connections (sendmail)
  503       0 sendmail: Queue runner@00:30:00 for /var/spool/clientmqueue (sendm
  509       0 /usr/sbin/cron -s
  558       0 sshd: ike [priv] (sshd)
  560       0 sshd: ike@ttyp0 (sshd)
  567       0 sshd: ike [priv] (sshd)
  569       0 sshd: ike@ttyp1 (sshd)
  577       0 dtach -c /tmp/JailLecture1 -Ez bash
  584       0 dtach -c /tmp/JailLecture2 -Ez bash
 1024       5 /usr/sbin/syslogd -s
 1088       5 /usr/sbin/sshd
 1095       5 sendmail: accepting connections (sendmail)
 1099       5 sendmail: Queue runner@00:30:00 for /var/spool/clientmqueue (sendm
 1105       5 /usr/sbin/cron -s
  550       0 /usr/libexec/getty Pc ttyv0
  551       0 /usr/libexec/getty Pc ttyv1
  552       0 /usr/libexec/getty Pc ttyv2
  553       0 /usr/libexec/getty Pc ttyv3
  554       0 /usr/libexec/getty Pc ttyv4
```

stop and start jail

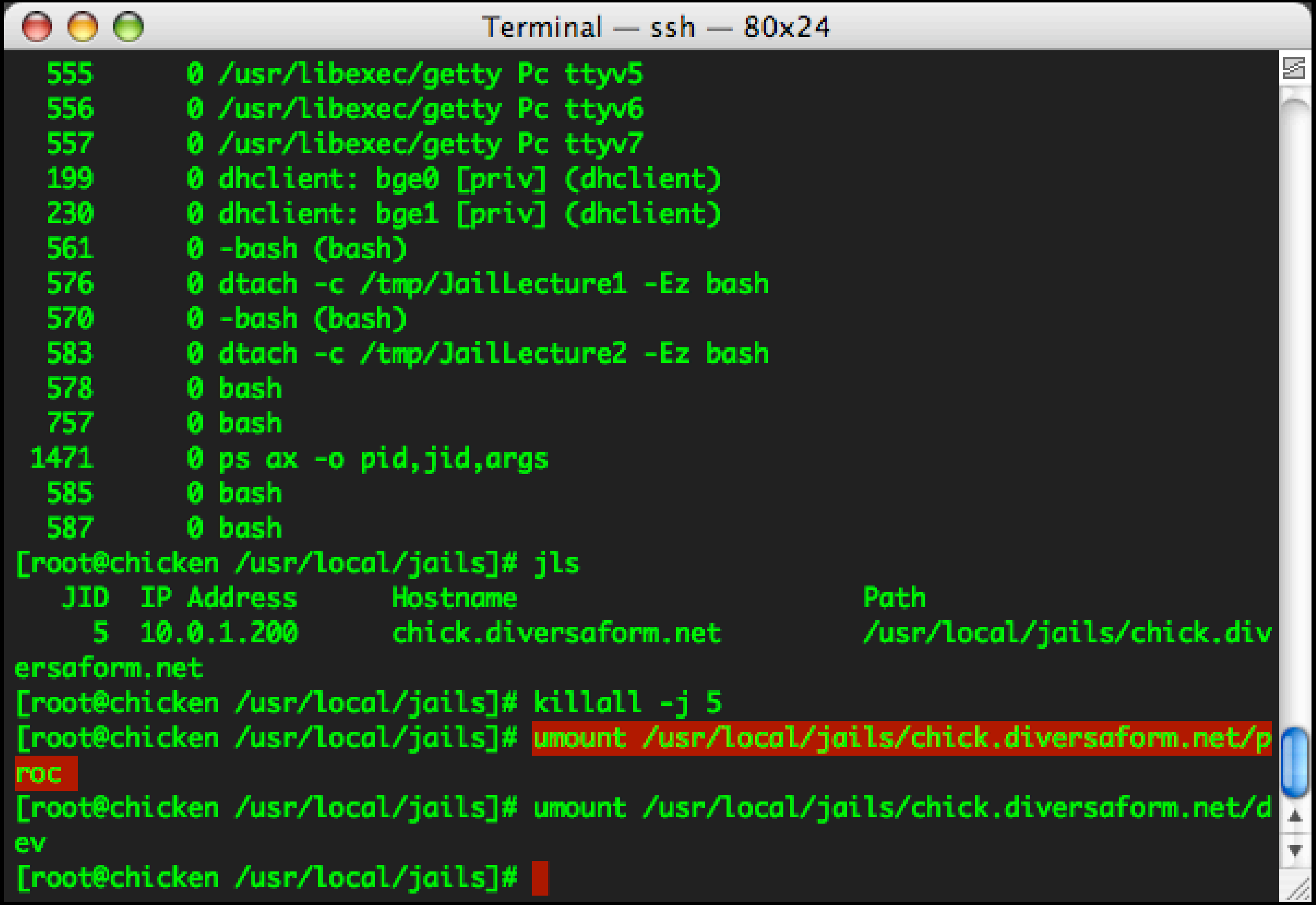
use killall with -j flag



```
  555      0 /usr/libexec/getty Pc ttyv5
  556      0 /usr/libexec/getty Pc ttyv6
  557      0 /usr/libexec/getty Pc ttyv7
  199      0 dhclient: bge0 [priv] (dhclient)
  230      0 dhclient: bge1 [priv] (dhclient)
  561      0 -bash (bash)
  576      0 dtach -c /tmp/JailLecture1 -Ez bash
  570      0 -bash (bash)
  583      0 dtach -c /tmp/JailLecture2 -Ez bash
  578      0 bash
  757      0 bash
 1471      0 ps ax -o pid,jid,args
  585      0 bash
  587      0 bash
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# killall -j 5
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/p
roc
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/d
ev
[root@chicken /usr/local/jails]# 
```

stop and start jail

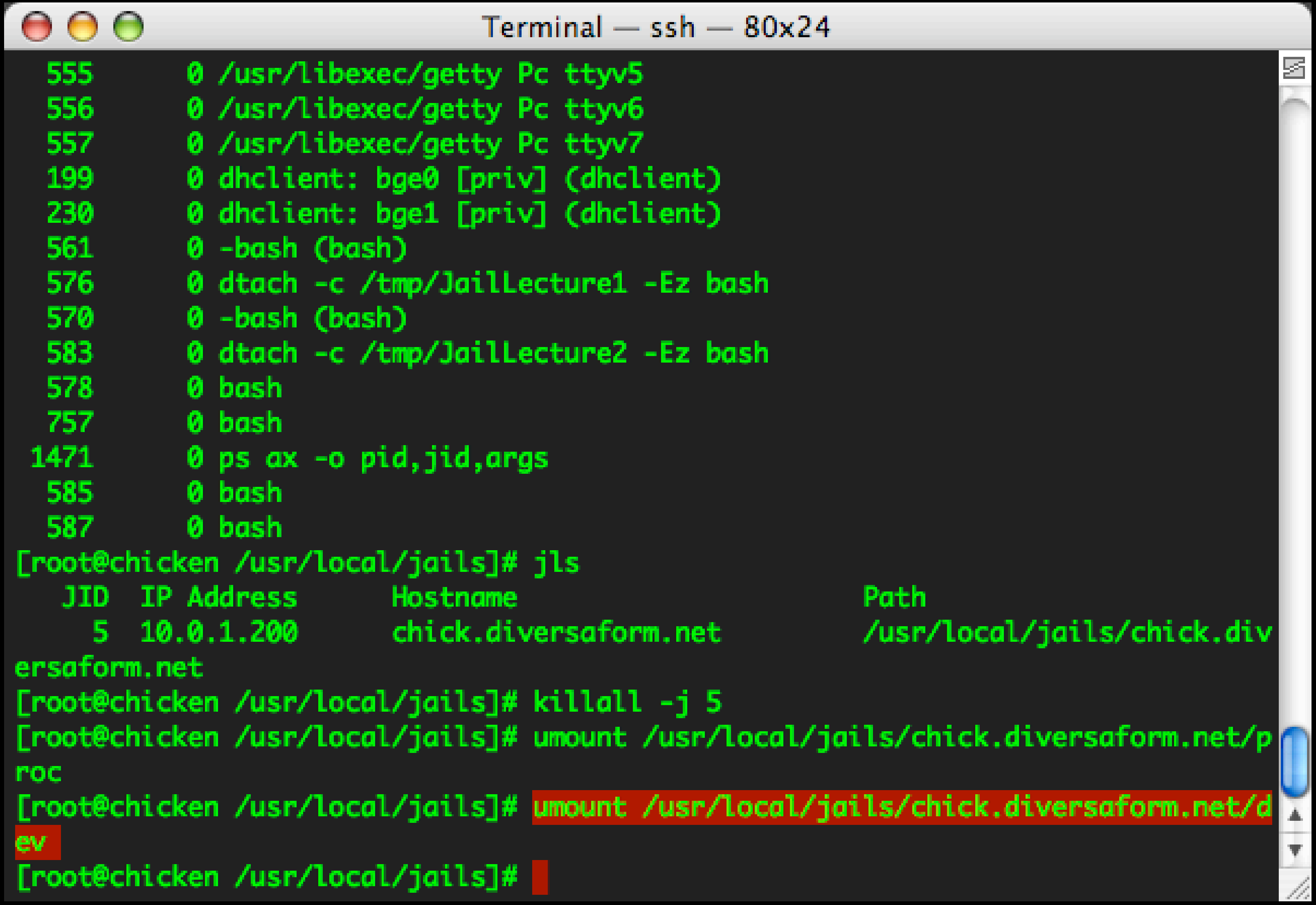
watch out for stacking mount points!



```
  555       0 /usr/libexec/getty Pc ttyv5
  556       0 /usr/libexec/getty Pc ttyv6
  557       0 /usr/libexec/getty Pc ttyv7
  199       0 dhclient: bge0 [priv] (dhclient)
  230       0 dhclient: bge1 [priv] (dhclient)
  561       0 -bash (bash)
  576       0 dtach -c /tmp/JailLecture1 -Ez bash
  570       0 -bash (bash)
  583       0 dtach -c /tmp/JailLecture2 -Ez bash
  578       0 bash
  757       0 bash
 1471       0 ps ax -o pid,jid,args
  585       0 bash
  587       0 bash
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                      Path
     5  10.0.1.200      chick.diversaform.net         /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# killall -j 5
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/p
roc
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/d
ev
[root@chicken /usr/local/jails]# 
```

stop and start jail

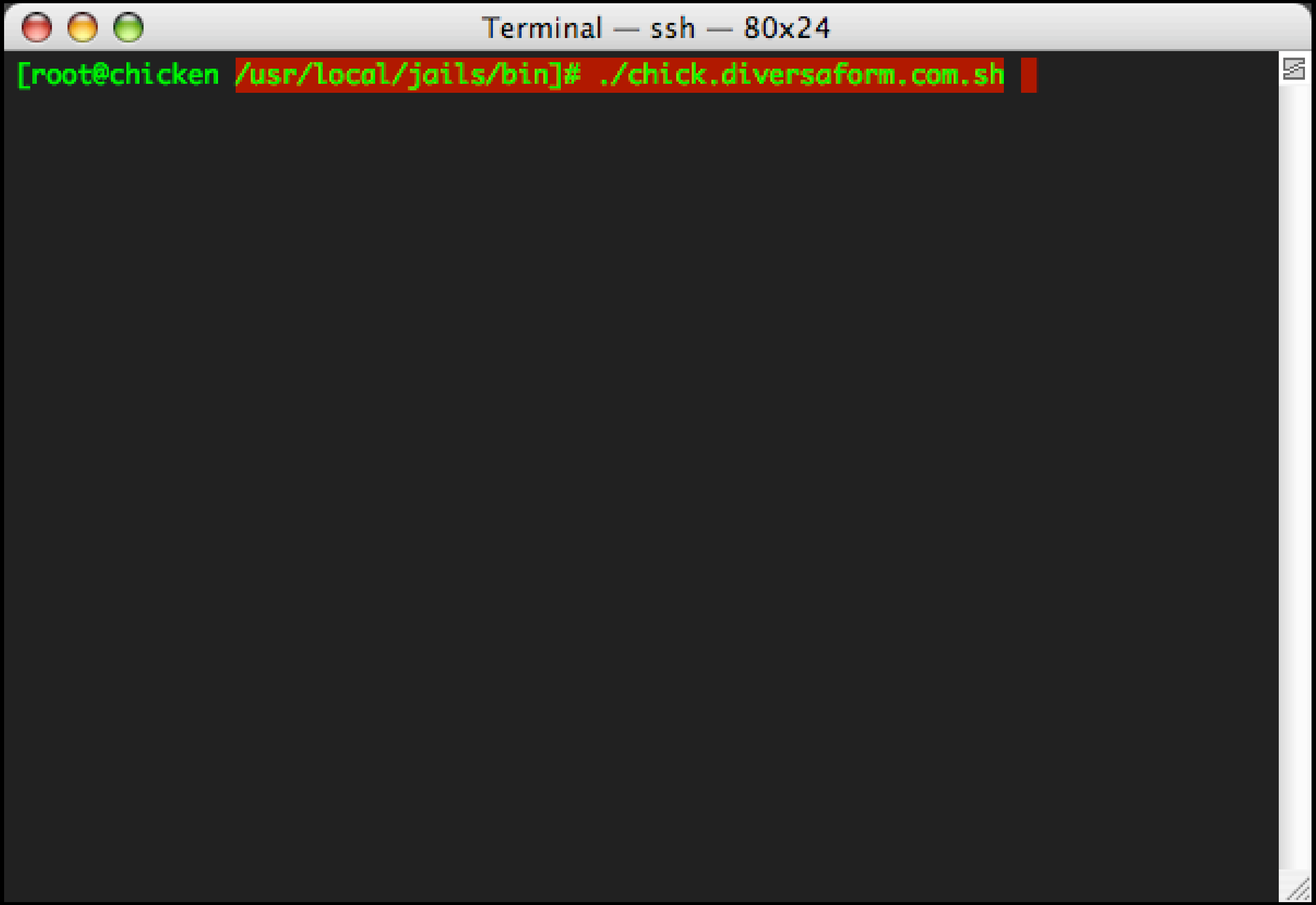
watch out for stacking mount points!



```
  555      0 /usr/libexec/getty Pc ttyv5
  556      0 /usr/libexec/getty Pc ttyv6
  557      0 /usr/libexec/getty Pc ttyv7
  199      0 dhclient: bge0 [priv] (dhclient)
  230      0 dhclient: bge1 [priv] (dhclient)
  561      0 -bash (bash)
  576      0 dtach -c /tmp/JailLecture1 -Ez bash
  570      0 -bash (bash)
  583      0 dtach -c /tmp/JailLecture2 -Ez bash
  578      0 bash
  757      0 bash
 1471      0 ps ax -o pid,jid,args
  585      0 bash
  587      0 bash
[root@chicken /usr/local/jails]# jls
   JID  IP Address      Hostname                        Path
     5  10.0.1.200      chick.diversaform.net           /usr/local/jails/chick.div
ersaform.net
[root@chicken /usr/local/jails]# killall -j 5
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/p
roc
[root@chicken /usr/local/jails]# umount /usr/local/jails/chick.diversaform.net/d
ev
[root@chicken /usr/local/jails]# 
```

stop and start jail

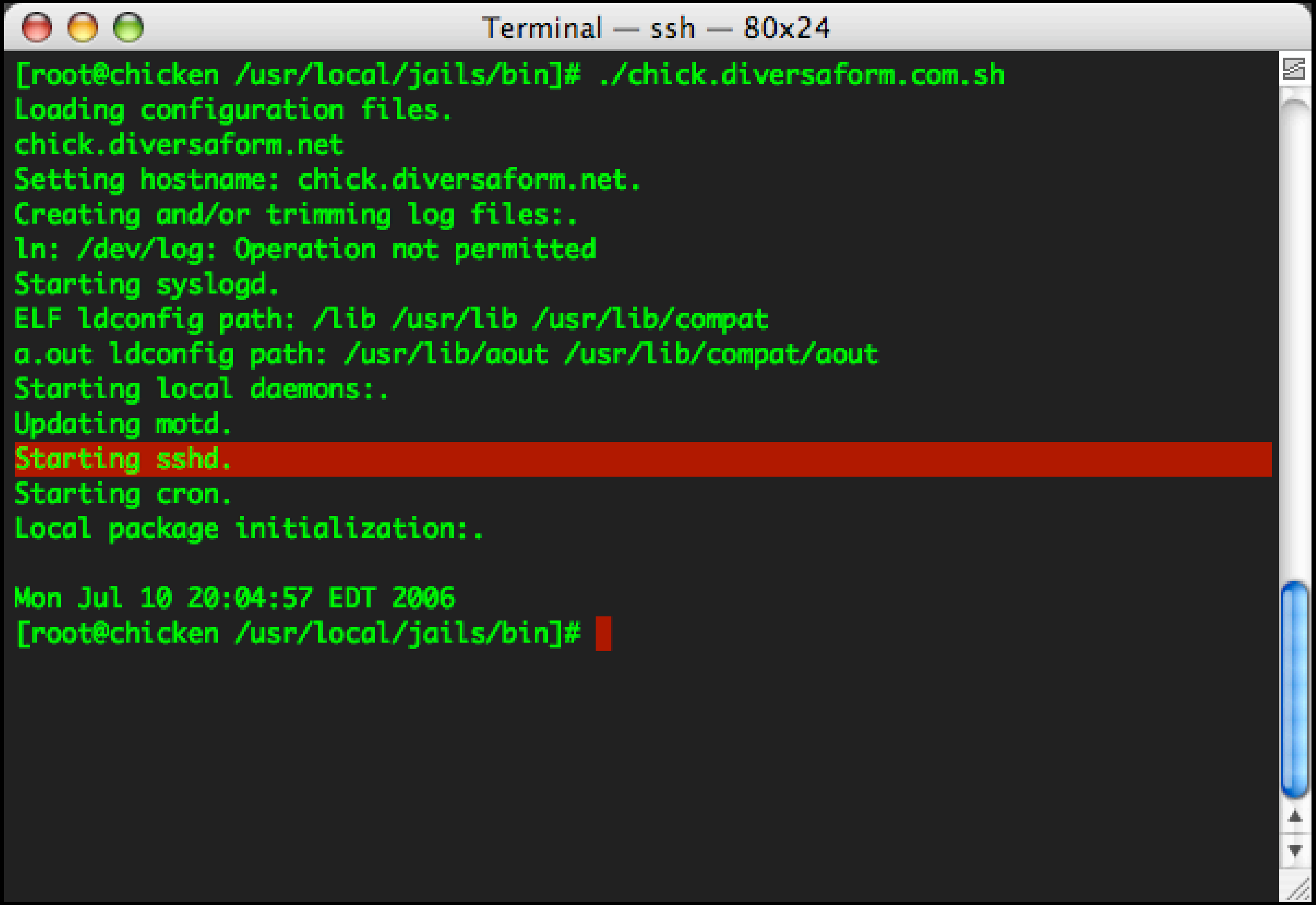
restarting with the script this time,



```
[root@chicken /usr/local/jails/bin]# ./chick.diversaform.com.sh
```

stop and start jail

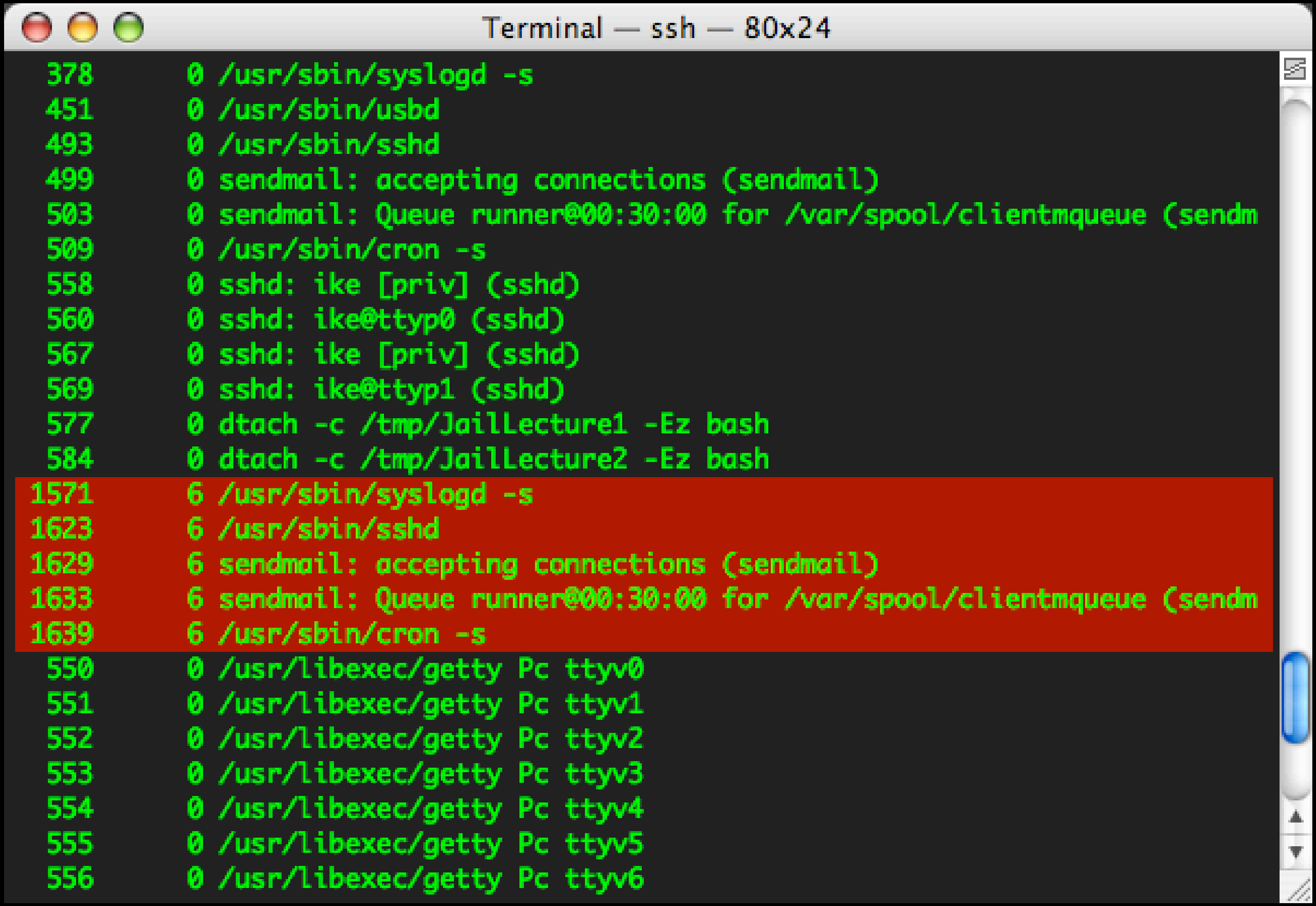
restarting with the script this time,



```
[root@chicken /usr/local/jails/bin]# ./chick.diversaform.com.sh
Loading configuration files.
chick.diversaform.net
Setting hostname: chick.diversaform.net.
Creating and/or trimming log files:.
ln: /dev/log: Operation not permitted
Starting syslogd.
ELF ldconfig path: /lib /usr/lib /usr/lib/compat
a.out ldconfig path: /usr/lib/aout /usr/lib/compat/aout
Starting local daemons:.
Updating motd.
Starting sshd.
Starting cron.
Local package initialization:.

Mon Jul 10 20:04:57 EDT 2006
[root@chicken /usr/local/jails/bin]#
```

stop and start jail

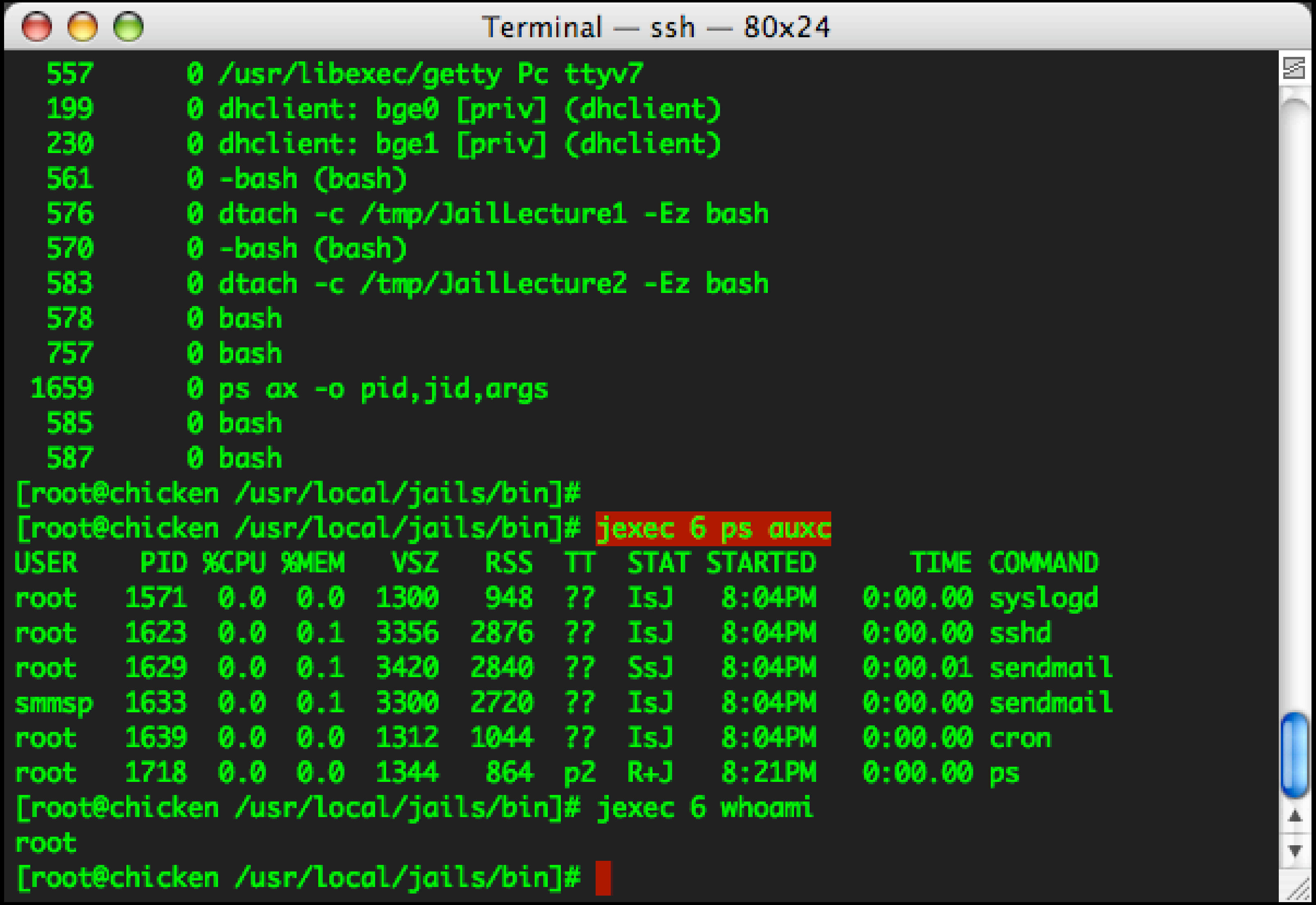
now the jid has incrimented once, to 6



```
  378       0 /usr/sbin/syslogd -s
  451       0 /usr/sbin/usbd
  493       0 /usr/sbin/sshd
  499       0 sendmail: accepting connections (sendmail)
  503       0 sendmail: Queue runner@00:30:00 for /var/spool/clientmqueue (sendm
  509       0 /usr/sbin/cron -s
  558       0 sshd: ike [priv] (sshd)
  560       0 sshd: ike@ttyp0 (sshd)
  567       0 sshd: ike [priv] (sshd)
  569       0 sshd: ike@ttyp1 (sshd)
  577       0 dtach -c /tmp/JailLecture1 -Ez bash
  584       0 dtach -c /tmp/JailLecture2 -Ez bash
 1571       6 /usr/sbin/syslogd -s
 1623       6 /usr/sbin/sshd
 1629       6 sendmail: accepting connections (sendmail)
 1633       6 sendmail: Queue runner@00:30:00 for /var/spool/clientmqueue (sendm
 1639       6 /usr/sbin/cron -s
  550       0 /usr/libexec/getty Pc ttyv0
  551       0 /usr/libexec/getty Pc ttyv1
  552       0 /usr/libexec/getty Pc ttyv2
  553       0 /usr/libexec/getty Pc ttyv3
  554       0 /usr/libexec/getty Pc ttyv4
  555       0 /usr/libexec/getty Pc ttyv5
  556       0 /usr/libexec/getty Pc ttyv6
```

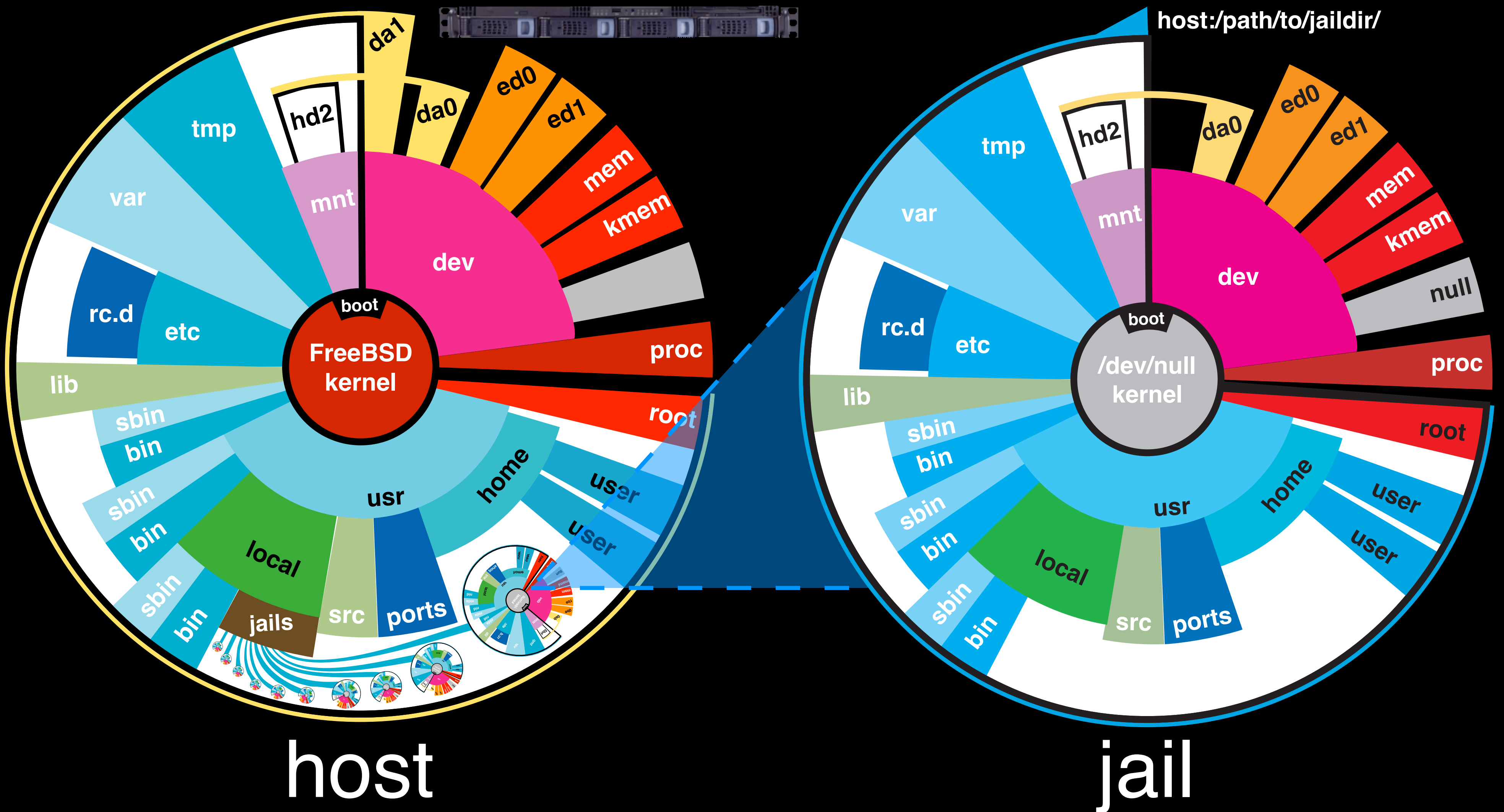
running processes

jexec to check processes (bad idea, in practice)



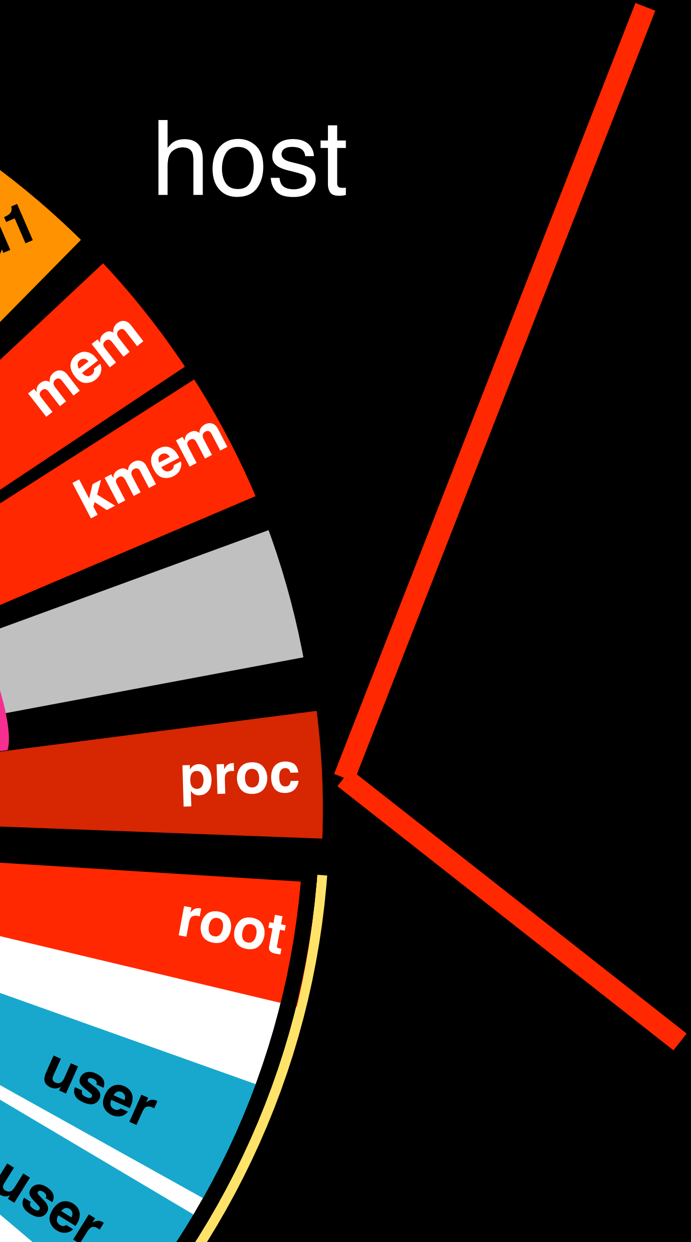
```
  557      0 /usr/libexec/getty Pc ttyv7
  199      0 dhclient: bge0 [priv] (dhclient)
  230      0 dhclient: bge1 [priv] (dhclient)
  561      0 -bash (bash)
  576      0 dtach -c /tmp/JailLecture1 -Ez bash
  570      0 -bash (bash)
  583      0 dtach -c /tmp/JailLecture2 -Ez bash
  578      0 bash
  757      0 bash
 1659      0 ps ax -o pid,jid,args
  585      0 bash
  587      0 bash
[root@chicken /usr/local/jails/bin]#
[root@chicken /usr/local/jails/bin]# jexec 6 ps auxc
USER     PID %CPU %MEM   VSZ   RSS  TT  STAT STARTED      TIME COMMAND
root    1571  0.0  0.0  1300   948  ??  IsJ    8:04PM  0:00.00 syslogd
root    1623  0.0  0.1  3356  2876  ??  IsJ    8:04PM  0:00.00 sshd
root    1629  0.0  0.1  3420  2840  ??  SsJ    8:04PM  0:00.01 sendmail
smmsp   1633  0.0  0.1  3300  2720  ??  IsJ    8:04PM  0:00.00 sendmail
root    1639  0.0  0.0  1312  1044  ??  IsJ    8:04PM  0:00.00 cron
root    1718  0.0  0.0  1344   864  p2  R+J    8:21PM  0:00.00 ps
[root@chicken /usr/local/jails/bin]# jexec 6 whoami
root
[root@chicken /usr/local/jails/bin]# 
```

Practical Comparison



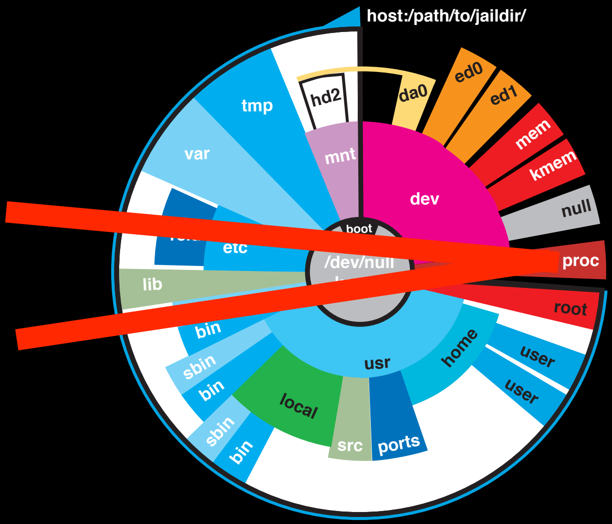
Process Tree:

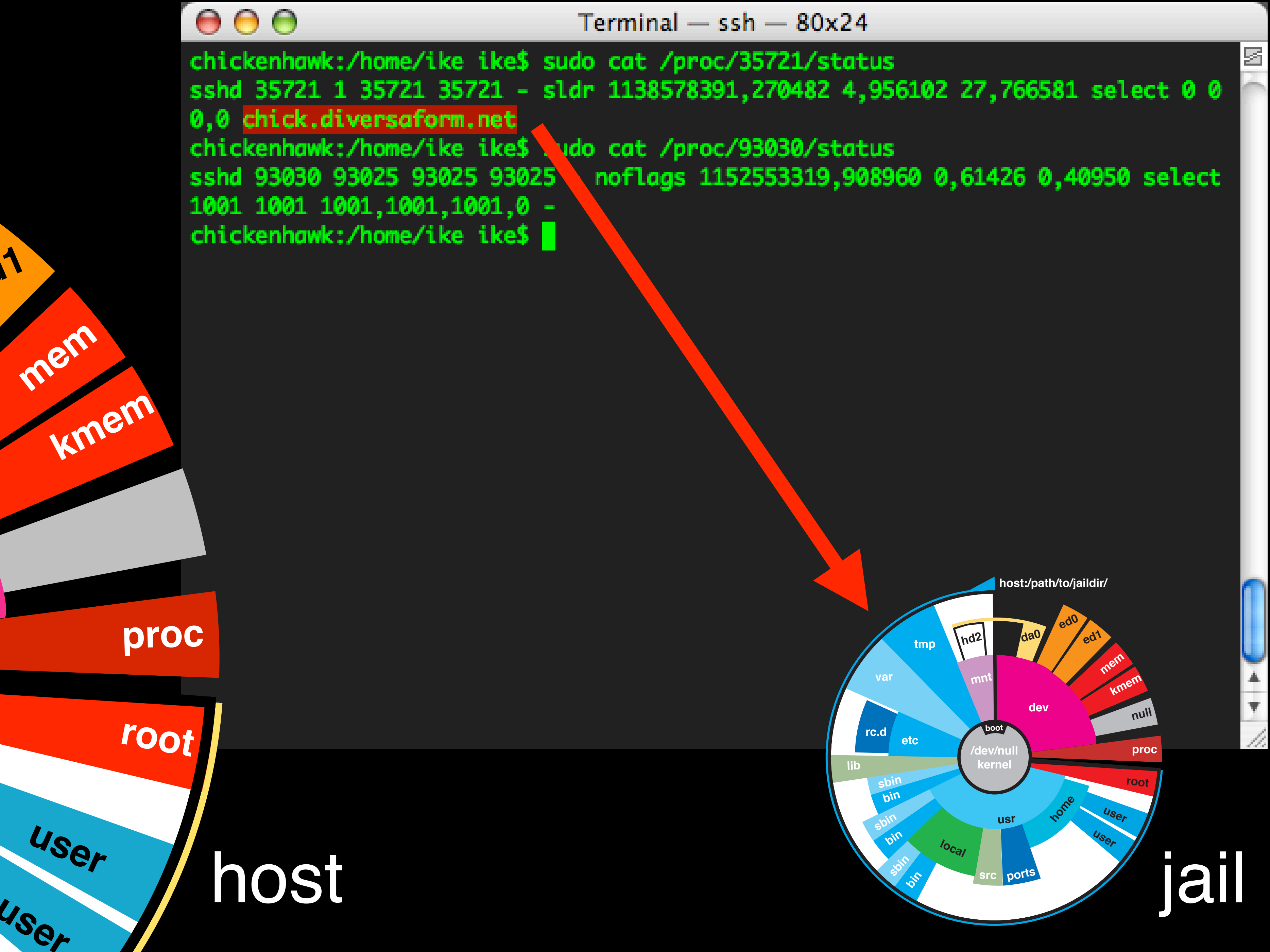
host



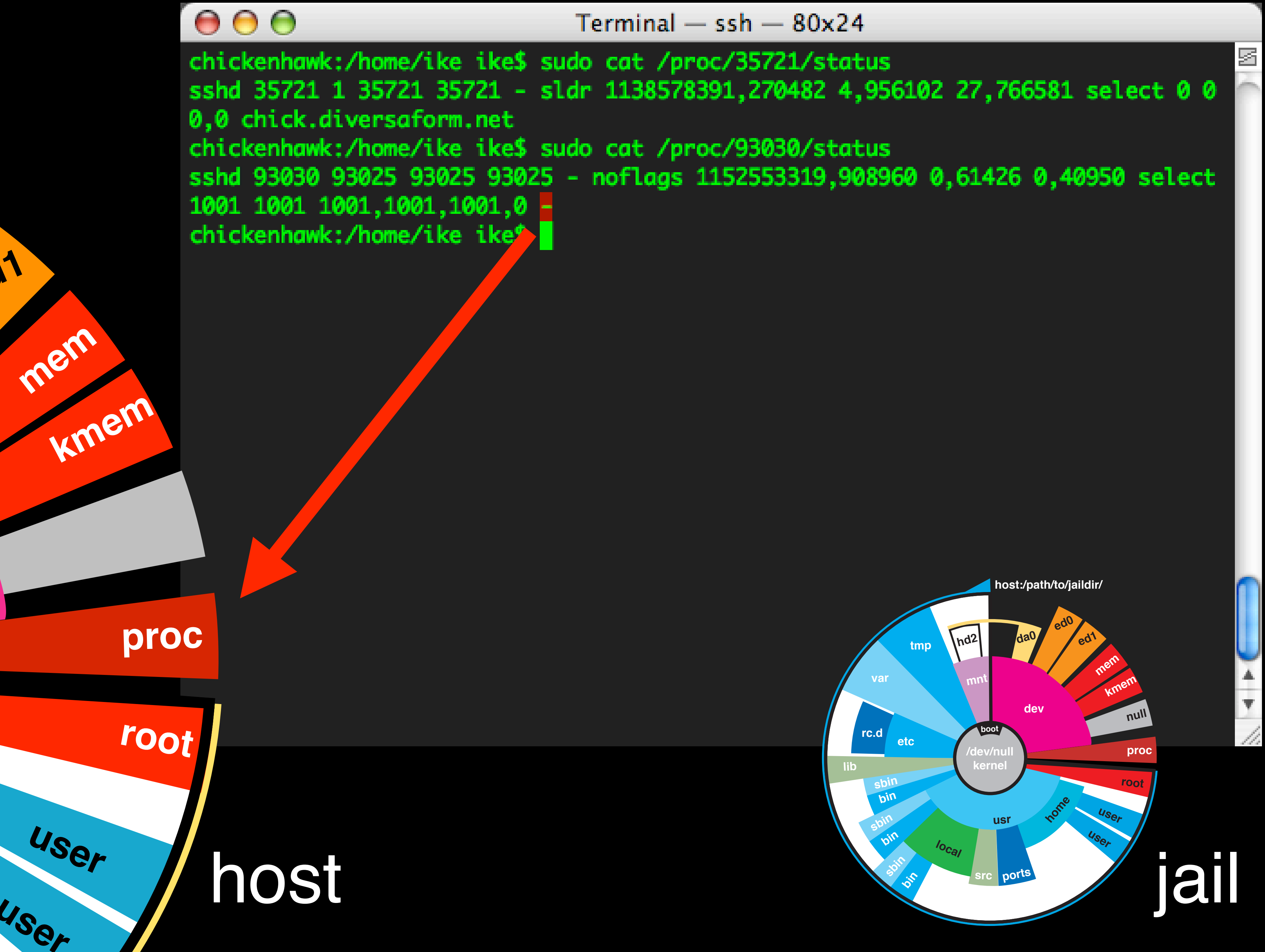
```
JailingServer
  \_init
       \_daemon/process etc...
       \_daemon/process etc...
       \_daemon/process etc...
       \_daemon/process etc...
       \_jail (Jail 1)
            \_daemon/process etc...
            \_daemon/process etc...
            \_daemon/process etc...
       \_jail (Jail 2)
            \_daemon/process etc...
            \_daemon/process etc...
            \_daemon/process etc...
       \_jail (Jail 3)
            \_daemon/process etc...
            \_daemon/process etc...
            \_daemon/process etc...
       \_jail (Jail 4)
            \_daemon/process etc...
            \_daemon/process etc...
            \_daemon/process etc...
```

jail

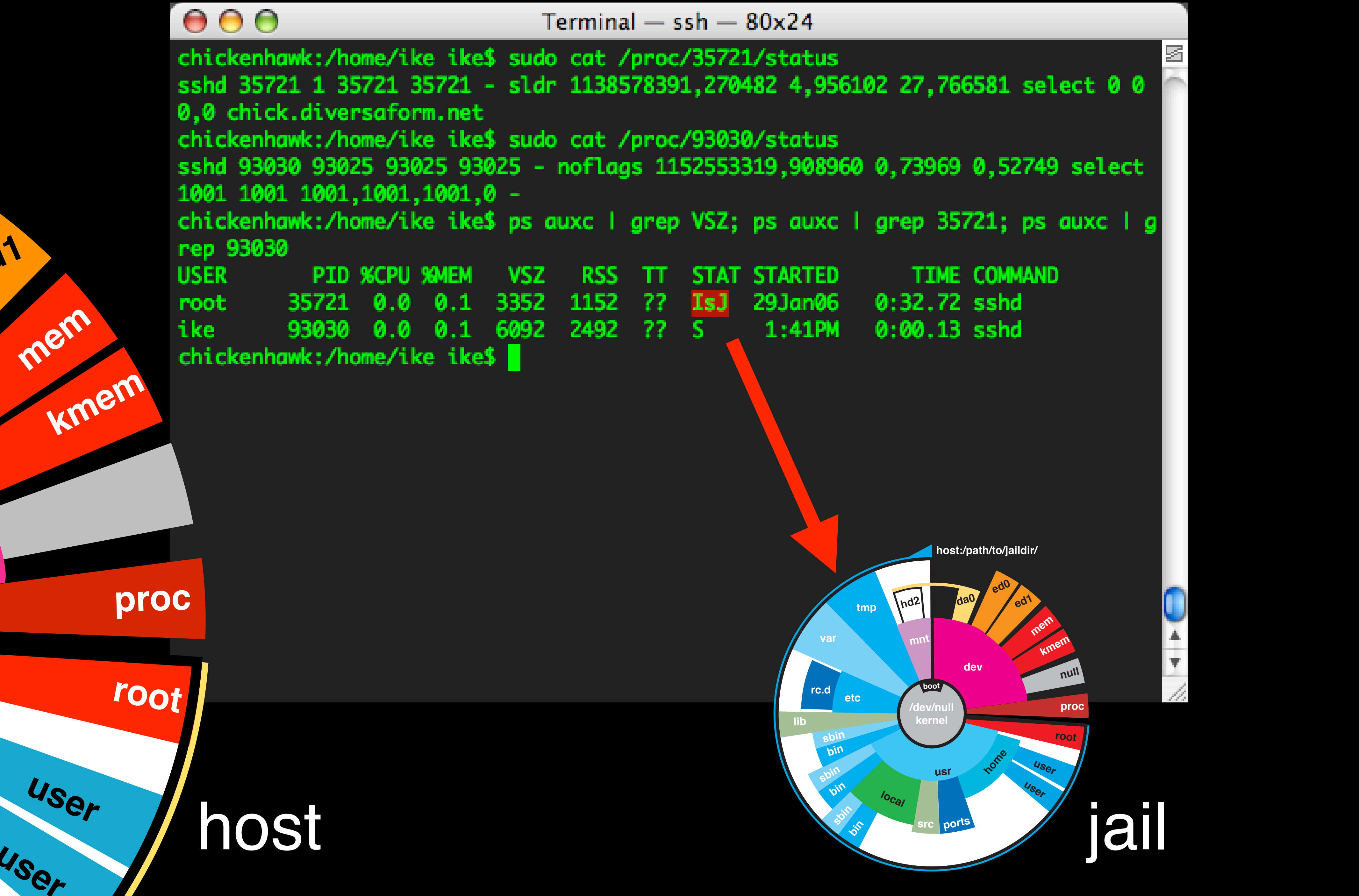




```
chickenhawk:/home/ike ike$ sudo cat /proc/35721/status
sshd 35721 1 35721 35721 - sldr 1138578391,270482 4,956102 27,766581 select 0 0
0,0 chick.diversaform.net
chickenhawk:/home/ike ike$ sudo cat /proc/93030/status
sshd 93030 93025 93025 93025 - noflags 1152553319,908960 0,61426 0,40950 select
1001 1001 1001,1001,1001,0 -
chickenhawk:/home/ike ike$ 
```



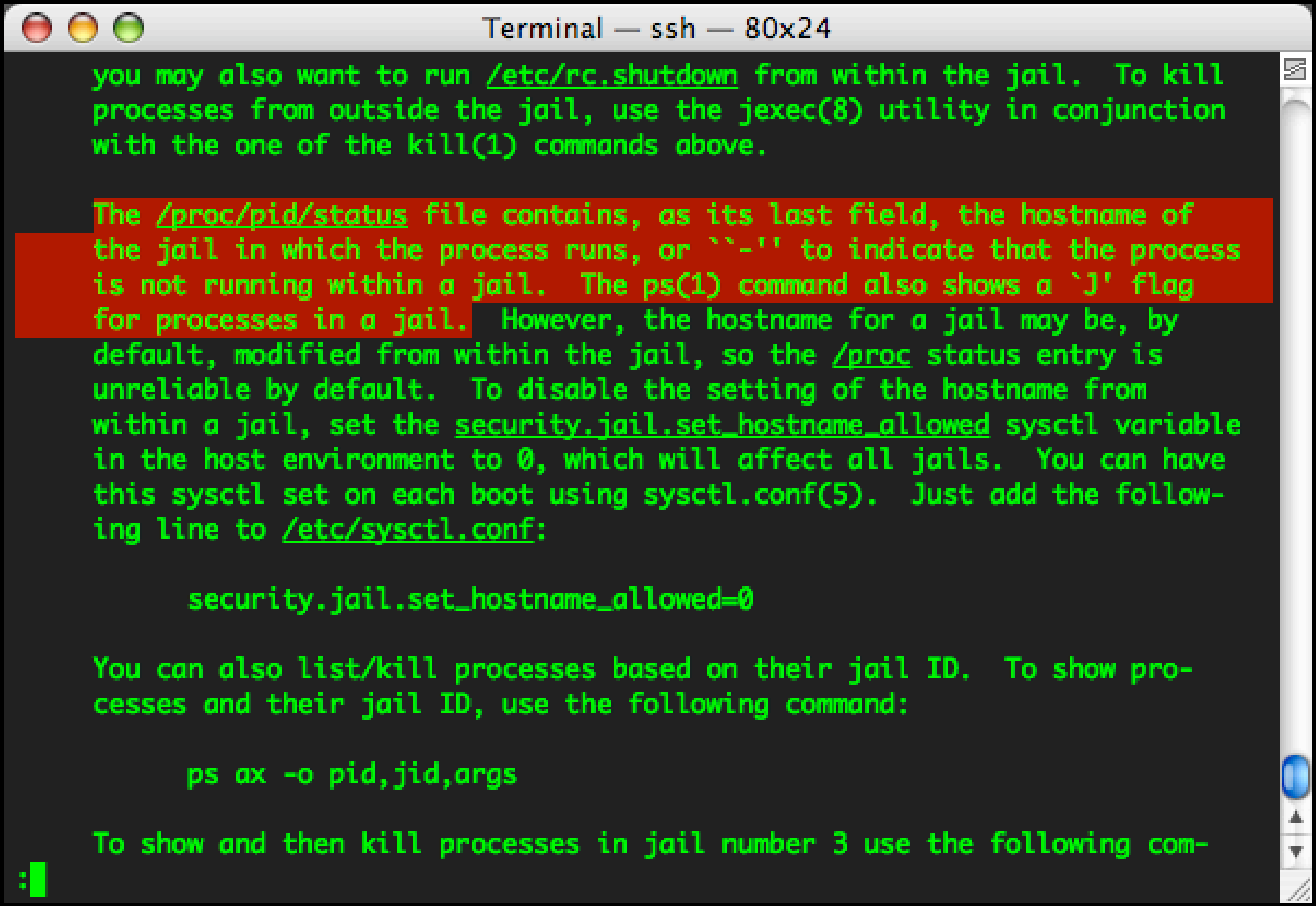
```
chickenhawk:/home/ike ike$ sudo cat /proc/35721/status
sshd 35721 1 35721 35721 - sldr 1138578391,270482 4,956102 27,766581 select 0 0
0,0 chick.diversaform.net
chickenhawk:/home/ike ike$ sudo cat /proc/93030/status
sshd 93030 93025 93025 93025 - noflags 1152553319,908960 0,61426 0,40950 select
1001 1001 1001,1001,1001,0 -
chickenhawk:/home/ike ike$
```



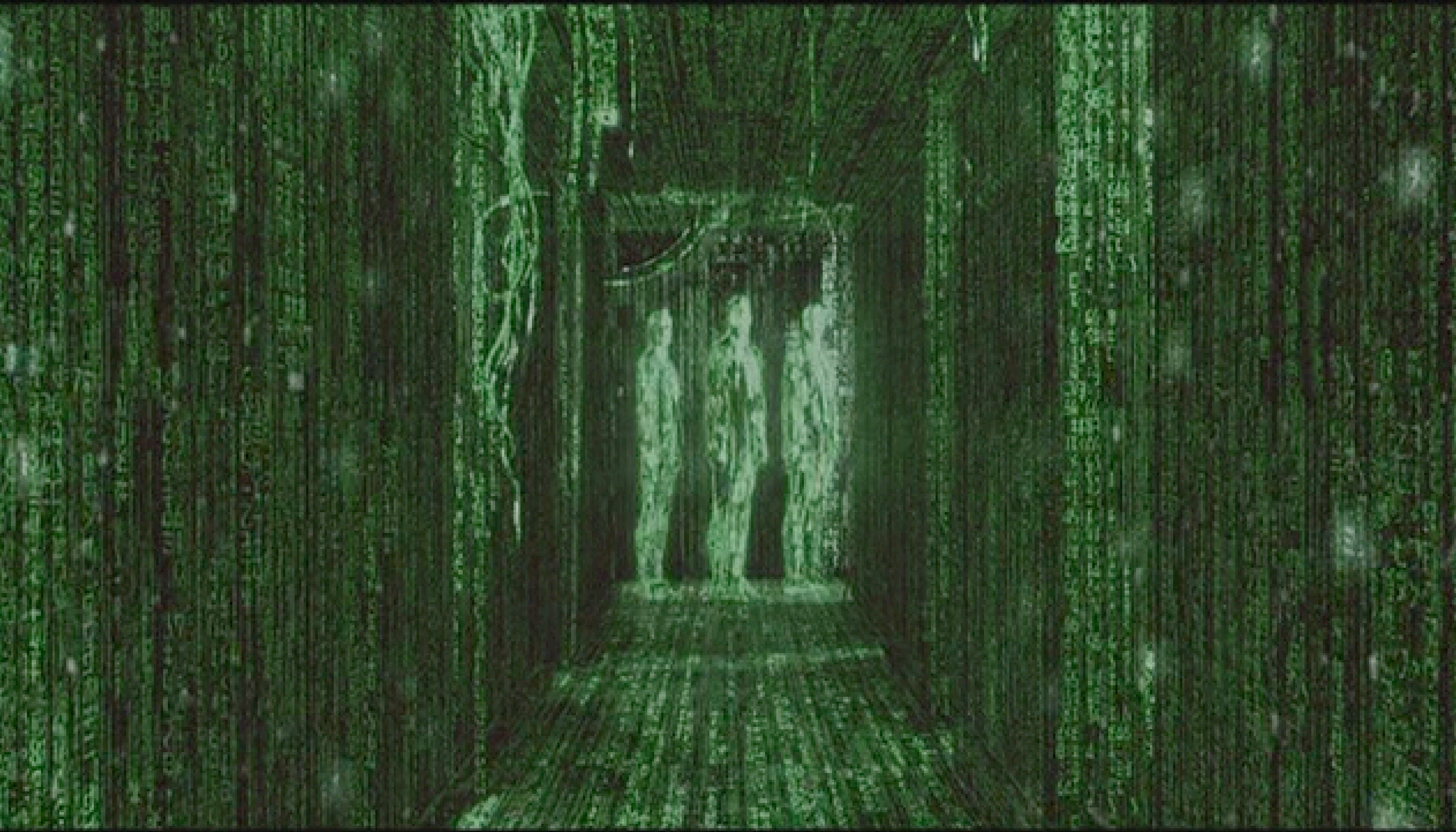
```
chickenhawk:/home/ike ike$ sudo cat /proc/35721/status
sshd 35721 1 35721 35721 - sldr 1138578391,270482 4,956102 27,766581 select 0 0
0,0 chick.diversaform.net
chickenhawk:/home/ike ike$ sudo cat /proc/93030/status
sshd 93030 93025 93025 93025 - noflags 1152553319,908960 0,73969 0,52749 select
1001 1001 1001,1001,1001,0 -
chickenhawk:/home/ike ike$ ps auxc | grep VSZ; ps auxc | grep 35721; ps auxc | g
rep 93030
USER       PID %CPU %MEM   VSZ   RSS  TT  STAT STARTED      TIME COMMAND
root     35721  0.0  0.1  3352  1152  ??  IsJ  29Jan06   0:32.72 sshd
ike      93030  0.0  0.1  6092  2492  ??  S     1:41PM   0:00.13 sshd
chickenhawk:/home/ike ike$ 
```

host

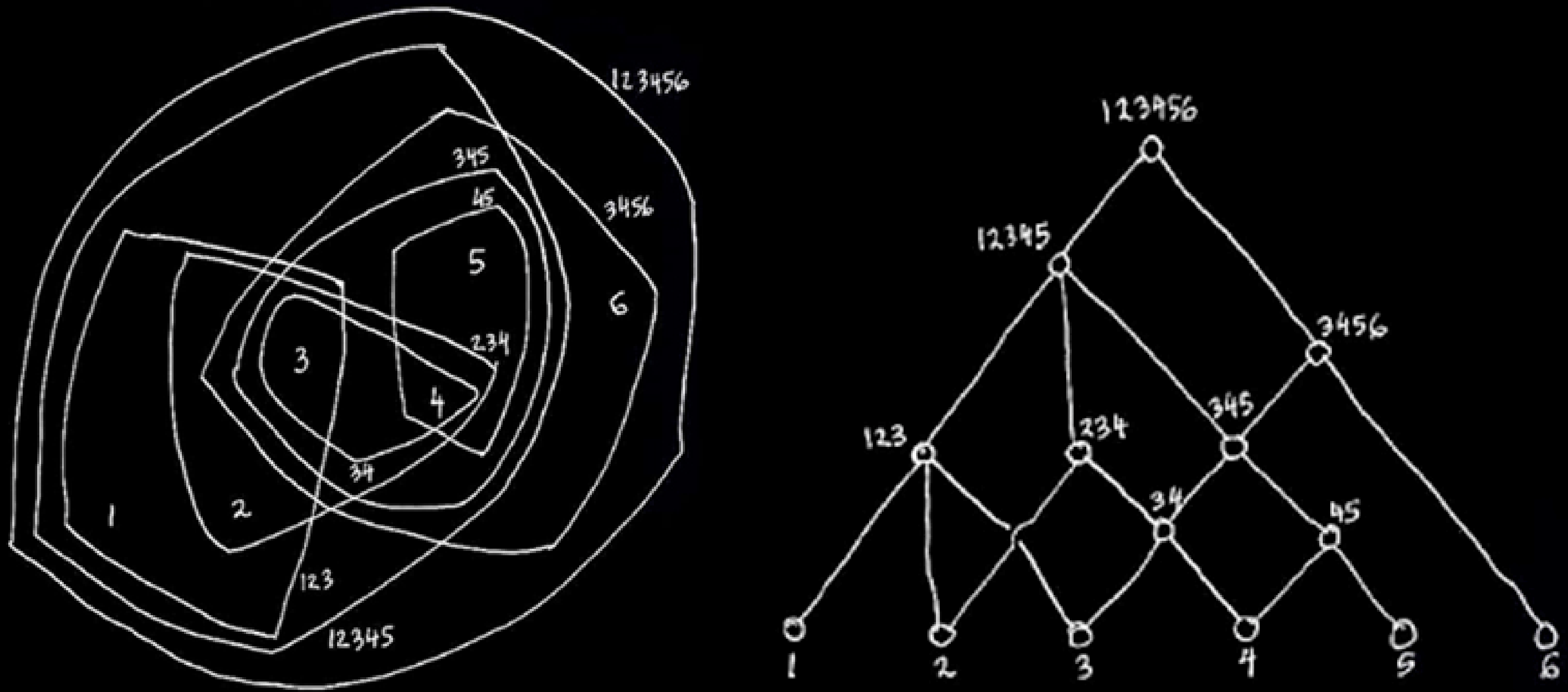
jail



```
     you may also want to run /etc/rc.shutdown from within the jail.  To kill
     processes from outside the jail, use the jexec(8) utility in conjunction
     with the one of the kill(1) commands above.

     The /proc/pid/status file contains, as its last field, the hostname of
     the jail in which the process runs, or ``-'' to indicate that the process
     is not running within a jail.  The ps(1) command also shows a `J' flag
     for processes in a jail.  However, the hostname for a jail may be, by
     default, modified from within the jail, so the /proc status entry is
     unreliable by default.  To disable the setting of the hostname from
     within a jail, set the security.jail.set_hostname_allowed sysctl variable
     in the host environment to 0, which will affect all jails.  You can have
     this sysctl set on each boot using sysctl.conf(5).  Just add the follow-
     ing line to /etc/sysctl.conf:

           security.jail.set_hostname_allowed=0

     You can also list/kill processes based on their jail ID.  To show pro-
     cesses and their jail ID, use the following command:

           ps ax -o pid,jid,args

     To show and then kill processes in jail number 3 use the following com-
:
```



jail(8) best practices



diagrams from “A City is Not A Tree” , essay by urban designer Christopher Alexander

and opportunities...

break out of jail?

Poul-Henning Kamp (PHK) wrote the jail feature for R&D Associates http://www.rndassociates.com/ who contributed it to FreeBSD around 1998.

To my knowledge, nobody has broken out of a jail directly, ever. It is however assumed that nobody has tried that hard yet, as it is still considered ‘esoteric’.

If someone breaks jail, PHK wrote that he would love to know about it.

best practices

- ssh into jails to manage their processes!!!!
- You always can see the jailed filesystem/userland from host server, be careful.
- Design your jailing system carefully, be creative with core UNIX utilities.
- Use your highest secure practices for host server...

great utilities

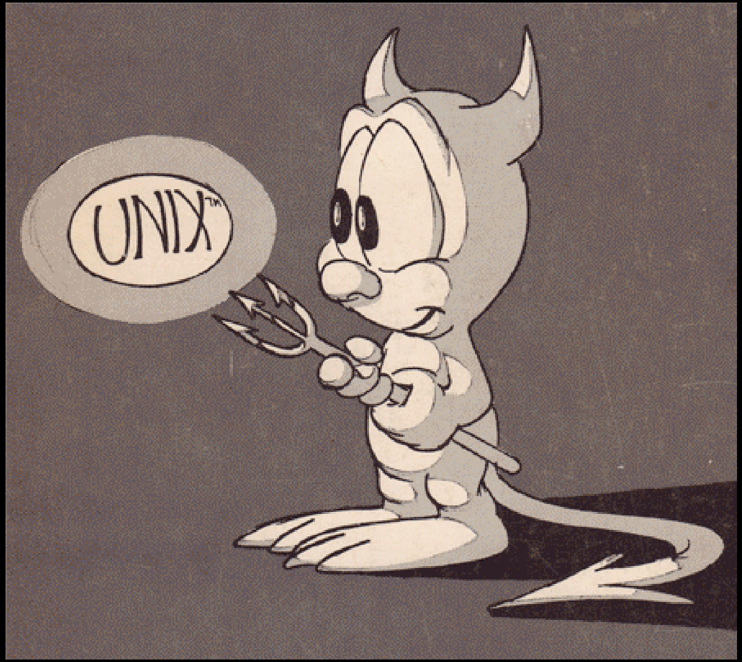
- 4.x, jps, jkill, jtop
- 5.x, 6.x, onward builtin ps, kill
  - !plus jls(8), jexec(8) jattach (2), sysctl features for jailing
- Design your jailing system carefully, be creative (note about nullfs, devfs)
- additionally, handy: pstree, xtail, disk images via mdconfig

common weak points

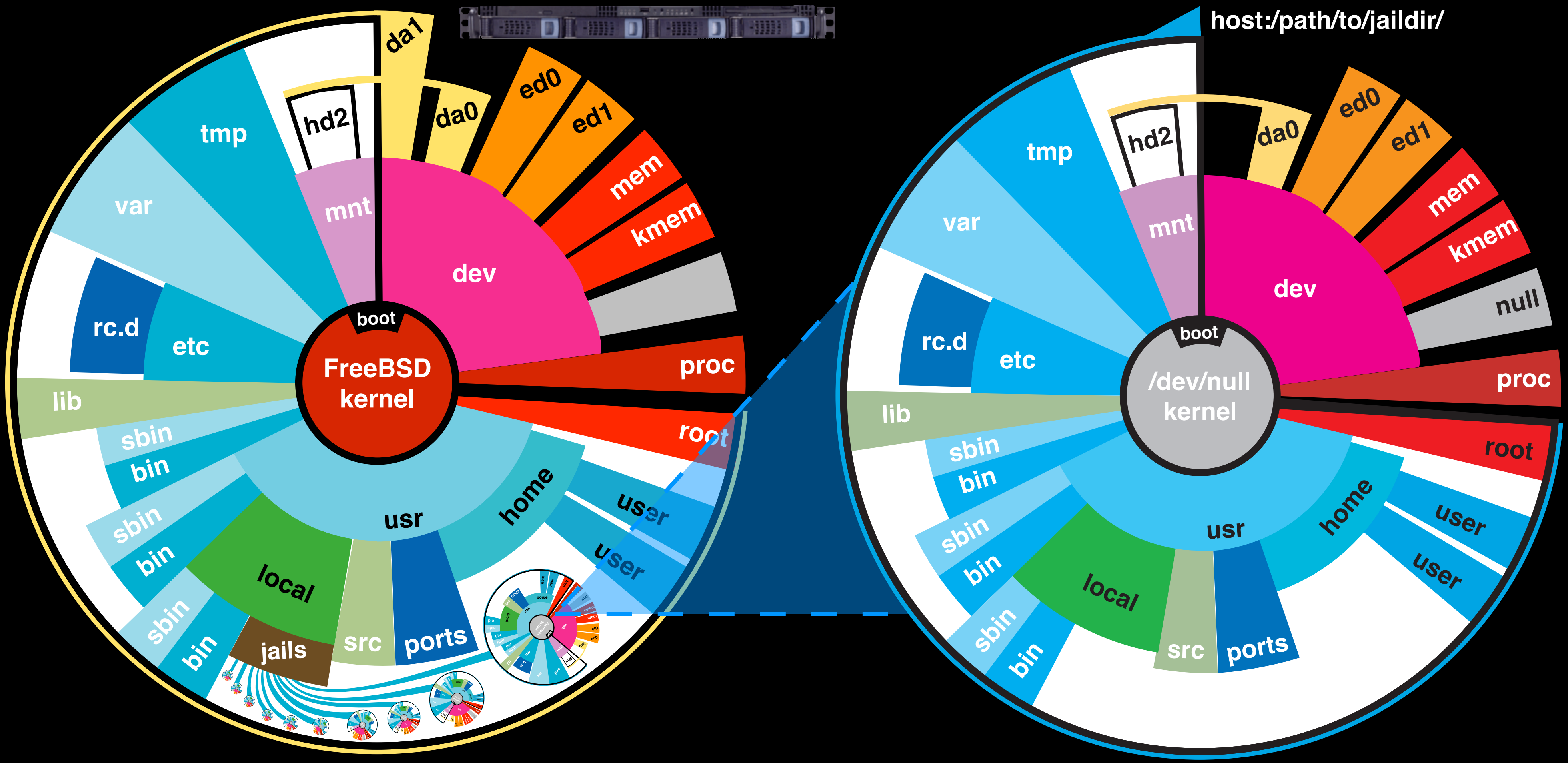
- lost jail?
  - [hostname lockdown]
- resource attacks
  - disks full
    - [partitions, disk images]
  - fork bombs, memory hogs
    - [securelevels, login.conf]
  - process control
- direct driver access
  - [flags to mount devfs, procfs]

common weak points

- lost jail?
  - [hostname lockdown]
- resource attacks
  - disks full
    - [partitions, disk images]
  - fork bombs, memory hogs
    - [securelevels, login.conf]
  - process control
- direct driver access
  - [flags to mount devfs, procfs]



Comments on Isolation



memory/process attacks

http://www.samag.com/documents/s=1151/sam0105d/0105d.htm
http://www.freebsd.org/doc/en_US.ISO8859-1/books/arch-handbook/jail.html

OpenRoot Project, fork-bombs, FreeBSD
SecureLevels/maxproc, reality, and process control

memory/process attacks

(check the Defcon 14 CD)

```
# hog.c, a small utility to hog system memory
# written by Brian Redman (BER) sometime around 1986
# Basic Instructions, Compile this code to a binary:

cc hog.c -o hog

# then run something like:

hog 10

# and the hog will do just that- sit and hog 10mb of ram.
# To run a hog stampede, (a fork bomb):

while (1)
hog 99m&
end
```

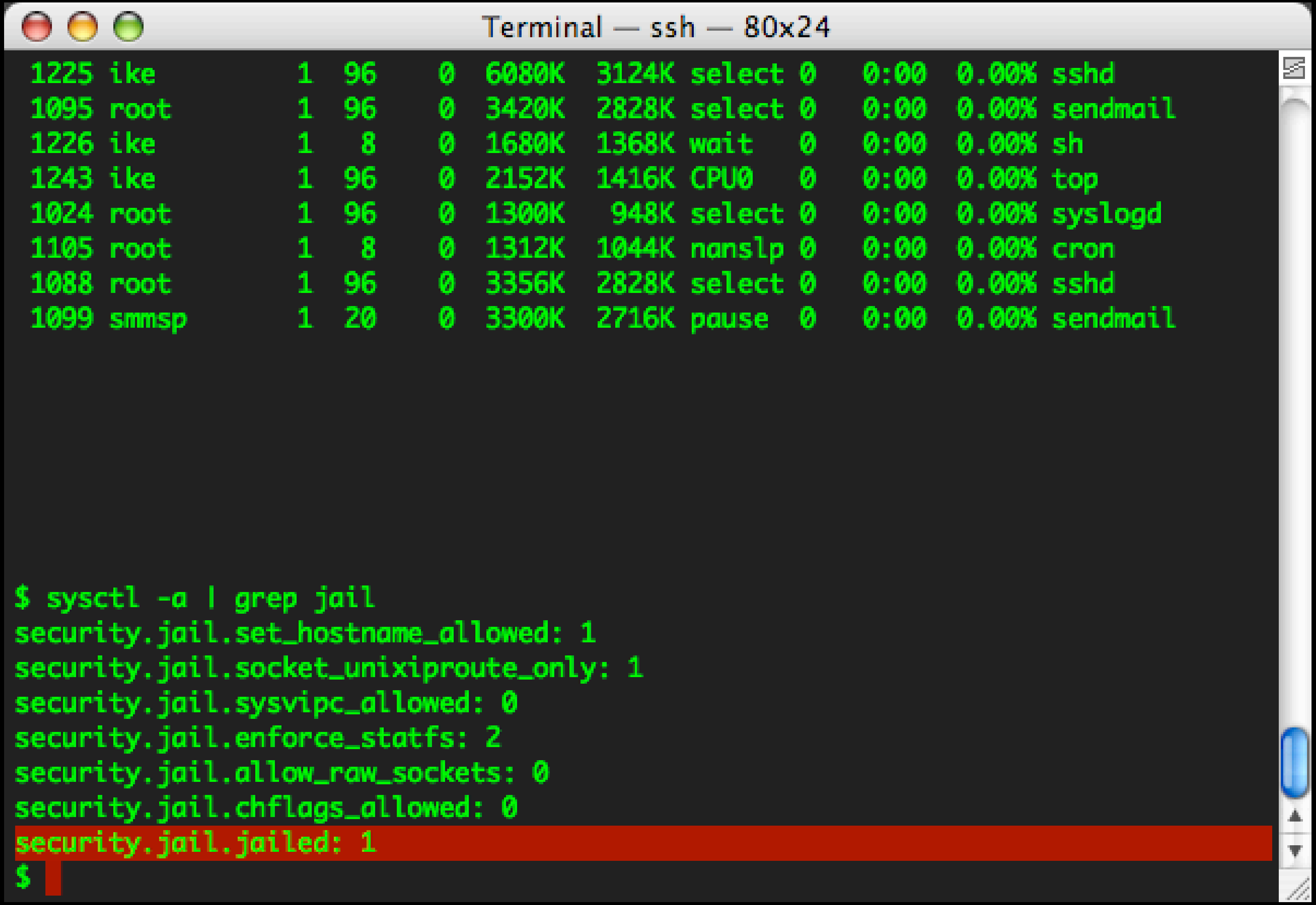
memory/process attacks

(check the Defcon 14 CD)

```
# STEP 1)
# jailed /etc/login.conf file, example of restricted values:
:maxproc=30:\
:memoryuse=25M:\

# STEP 2)
# Set immutable flags on jailed /etc/login.conf, example:
chflags schg $D/etc/login.conf

# STEP 3)
# Set a higher securelevel on a per-jail basis
# (5.x onward, 4.x jailing only securlevels for entire host)
# add the following line to the jailed /etc/sysctl.conf:

kern.securelevel=2
# securelevel 1 is minimum, read the man page for securelevel
```

honeypot?

compile and give the jail a kernel, fix sysctl:



```
 1225 ike          1  96    0 6080K 3124K select 0   0:00  0.00% sshd
 1095 root         1  96    0 3420K 2828K select 0   0:00  0.00% sendmail
 1226 ike          1   8    0 1680K 1368K wait   0   0:00  0.00% sh
 1243 ike          1  96    0 2152K 1416K CPU0   0   0:00  0.00% top
 1024 root         1  96    0 1300K  948K select 0   0:00  0.00% syslogd
 1105 root         1   8    0 1312K 1044K nanslp 0   0:00  0.00% cron
 1088 root         1  96    0 3356K 2828K select 0   0:00  0.00% sshd
 1099 smmsp        1  20    0 3300K 2716K pause  0   0:00  0.00% sendmail







$ sysctl -a | grep jail
security.jail.set_hostname_allowed: 1
security.jail.socket_unixiproute_only: 1
security.jail.sysvipc_allowed: 0
security.jail.enforce_statfs: 2
security.jail.allow_raw_sockets: 0
security.jail.chflags_allowed: 0
security.jail.jailed: 1
$ 
```

http://www.freebsd.org/cgi/query-pr.cgi?pr=95977

disk resource control

- Put at least your jailed systems on a seperate partition, or perhaps each jail (rigid in practice)
- File-Backed Disk Images (mdconfig, in handbook)- insanely flexible, but take extra memory (usually negligible)

file-backed disks (.dmg)

- WOW, they’re convienent.
- watch out for device numbering (or things get lost), here’s where Jailing strategies from 4.x come in handy... unless someone has a better way of manging device nodes
- speed is getting excellent for file-backed memorry disks, but will always introduce some overhead in file I/O

file-backed disks (.dmg)

FreeBSD handbook has tons more information!

```
# writing 1gb blank file, (analagous to creating an
unformatted harddrive)
dd if=/dev/zero of=1gb.img bs=1k count=1024k

# attaching the file (analagous to attaching a harddrive)...
mdconfig -a -t vnode -f 1gb.img -u 1101

# formating the disk...
disklabel -r -w md1101 auto

# detaching the disk (analagous to ejecting a harddrive)...
mdconfig -d -u 1101
```

file-backed disks (.dmg)

mount disks when starting jails,

```
<snip - jail start script>


mdconfig -a -t vnode -f /path/to/jaildisk_file.dmg -u 200
mount /dev/md200c /path/to/jail_userland_mount_dir

# regarding '-u 200' above, it can be handy to use some
# variant of a jail's respective IP address for it's disk
# image devide node id, so it's easy to track down on host
# system with many jailed servers.

# later in script,
jail /path/to/jail_userland_mount_dir \
hostname.fqdn.com \
10.0.1.200 \
/bin/sh /etc/rc

</snip>
```

automation

- Tarball packaging is your friend.

  clean, simple, reliable.

    be aware of dev/proc mounts

    be aware of symlinks
- use FreeBSD Ports Mechanism!

  (**not** for the ports collection, that’s insanely presumptuous, [borderline irresponsible]
- CVS/SVN anyone?

upgrading jailed systems

- Simply use buildworld, (FROM HOST SYSTEM),
- toss buildworld DESTDIR flag, with a jail’s userland path
- follow the handbook: http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/makeworld.html

/etc/sysctl.conf (host)

(check the Defcon 14 CD)

```
# $FreeBSD: src/etc/sysctl.conf,v 1.8 2003/03/13 18:43:50 mux Exp $
#
#  This file is read when going to multi-user and its contents piped thru
#  ``sysctl'' to adjust kernel values.  ``man 5 sysctl.conf'' for details.
#

# Uncomment this to prevent users from seeing information about processes that
# are being run under another UID.
#security.bsd.see_other_uids=0

# ikenote jailing additives
security.jail.set_hostname_allowed=0    # default = 1 # jailed resetting hostname.
security.jail.enforce_statfs=2          # default = 2 # mount point info.
security.jail.allow_raw_sockets=0       # default = 0 # for ping, etc...
security.jail.socket_unixiproute_only=1 # default = 1 # access to routing sockets.
security.jail.sysvipc_allowed=0         # default = 0 # SysV shareed mem? Ha!
security.jail.chflags_allowed=0         # default = 0 # root less than root...
```

sysctl (stock values)

(check the Defcon 14 CD)

```
$ sysctl -a | grep jail
security.jail.set_hostname_allowed: 0
security.jail.socket_unixiproute_only: 1
security.jail.sysvipc_allowed: 0
security.jail.enforce_statfs: 2
security.jail.allow_raw_sockets: 0
security.jail.chflags_allowed: 0
security.jail.jailed: 0
```

firewalls (quick comment)

- context:
  - *why jail in the first place again?*
  - threats affect an entire host server
  - firewall at a higher level (mental shift to treat the host like a network gateway!)
    - global system firewalling, throttling
    - different boxes? different rules?

Start Script w/ Disk Image

(check the Defcon 14 CD)

```
#!/bin/sh

# simple, complete script to start a jail.

# define the absolute path to the jail,
J=/usr/local/jails/jailed.userland.directory

# define the ip address for the jail,
I=10.0.1.192

# define a hostname,
H=fqdn.com

ifconfig en0 inet alias $I/32

mount -t procfs proc $J/proc
mount_devfs devfs $J/dev
## add additonal flags to mount_devfs, to hide unnecessary devices!!!
## check the man page for mount_devfs

jail $J $H $I /bin/sh /etc/rc
```

jail crontab misc...

(check the Defcon 14 CD)

```
# comment out the following, just to keep syslog quiet for irrelevant items.

# Save some entropy so that /dev/random can re-seed on boot.
# */11  *       *       *       *       operator /usr/libexec/save-entropy

# Adjust the time zone if the CMOS clock keeps local time, as opposed to
# UTC time.  See adjkerntz(8) for details.
# 1,31  0-5     *       *       *       root    adjkerntz -a
```

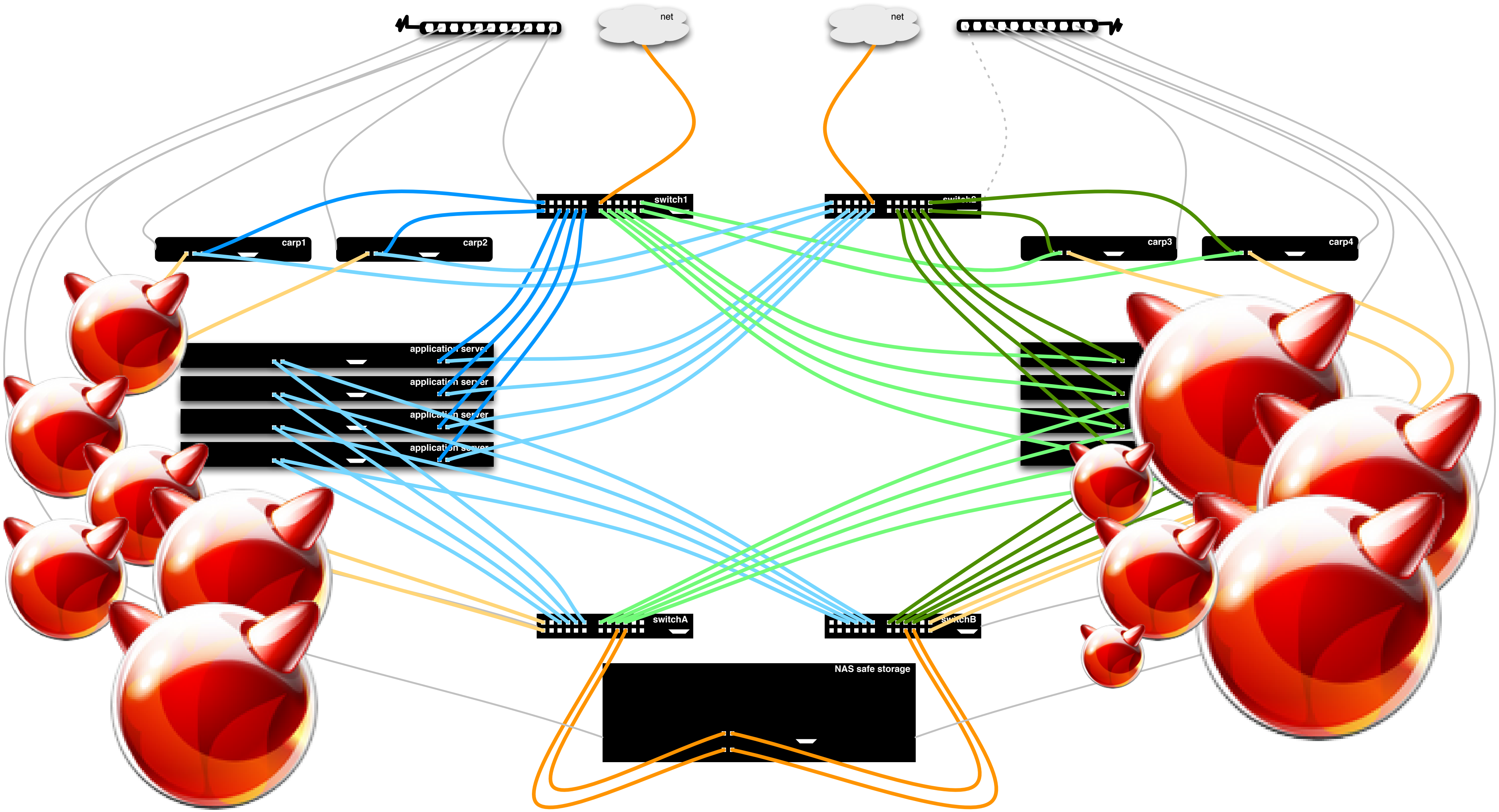
future directions...

important fun:

- CARP, from PF/OpenBSD
- GEOM
- NFS Improvements
- more NAS/SAN support (GEOM, ggated)
- FreeBSD 4.x, 5.x, 6.x, (7x!)

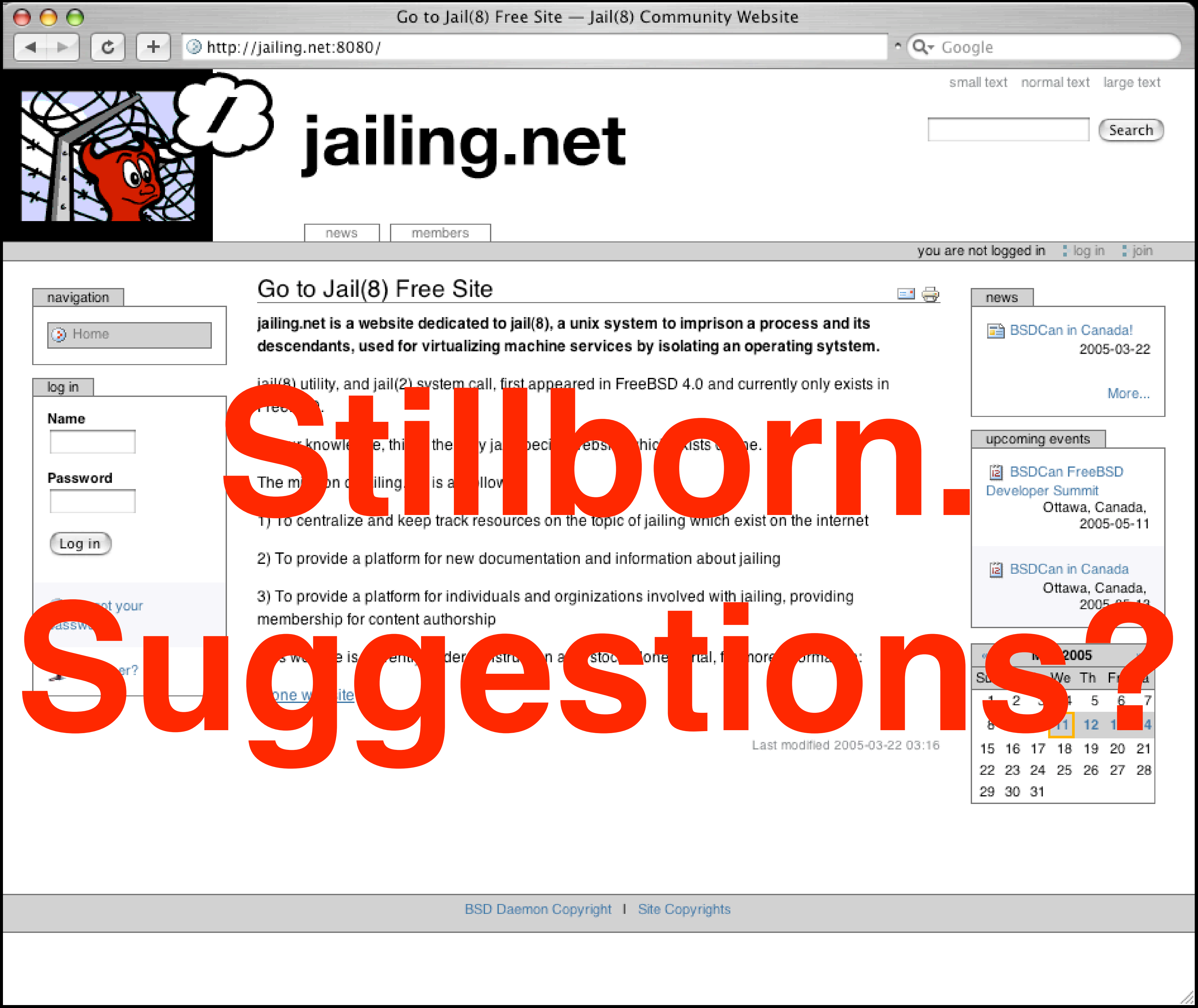
sick possibilities...

GEOM Gate, CARP, fun with failover jails...



misc

- Compile md(4) into the kernel for File-Backed Disks, for better performance
- GOTCHA: rm a jail directory? chflags -R noschg jaildir



Go to Jail(8) Free Site

jailing.net is a website dedicated to jail(8), a unix system to imprison a process and its descendants, used for virtualizing machine services by isolating an operating sytstem.

jail(8) utility, and jail(2) system call, first appeared in FreeBSD 4.0 and currently only exists in Free...D.

...r knowle...e, thi... the...y ja...peci...ebsi...hic...ists ...ne.

The mi...on ...iling... is a...llow...

1) To centralize and keep track resources on the topic of jailing which exist on the internet

2) To provide a platform for new documentation and information about jailing

3) To provide a platform for individuals and orginizations involved with jailing, providing membership for content authorship

...s we...e is ...ent... ...der ...stru...n a... ...stoc... ...one ...rtal, f... ...ore ...orma...:

...one w...ite

Last modified 2005-03-22 03:16

BSDCan in Canada!
2005-03-22
More...

BSDCan FreeBSD Developer Summit
Ottawa, Canada,
2005-05-11

BSDCan in Canada
Ottawa, Canada,
2005-...-1...

Su			We	Th	Fr	Sa
1	2	3	4	5	6	7
8			11	12	1	4
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

BSD Daemon Copyright | Site Copyrights

Stillborn.

Suggestions?

NYCBUG

NEW YORK CITY *BSD USER GROUP

Jailing Party - jail(8)
Friday-Monday, Sept.3-6 2004
Next time we get more resiliant hardware...
Thanks everyone for all the fun!

Special Thanks:

wintermute (of iMeme), taught me to jail(8).
He's here somewhere- buy him a drink.

reality schooled me more BSD than he knows...

Poul-Henning Kamp wrote the jail feature for R&D Associates http://www.rndassociates.com/ who contributed it to FreeBSD around 1998.

Robert Watson wrote the extended documentation, found a few bugs, added a few new features, and cleaned up the userland jail environment.

ike is proud to be a part of the ***New York City *BSD Users Group***,
and the ***Lower East Side Mac Unix Users Group***

NYCBUG
NEW YORK CITY *BSD USER GROUP

isaac@diversaform.com

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