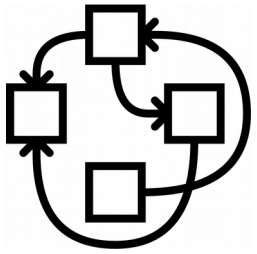


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# Debian GNU/Hurd Status update

Samuel Thibault

2015 August 17th



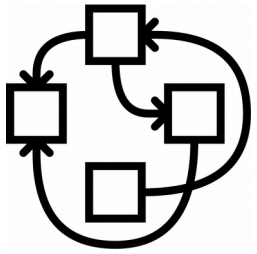
# It's all about freedom #0

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“The freedom to run the program, for any purpose”

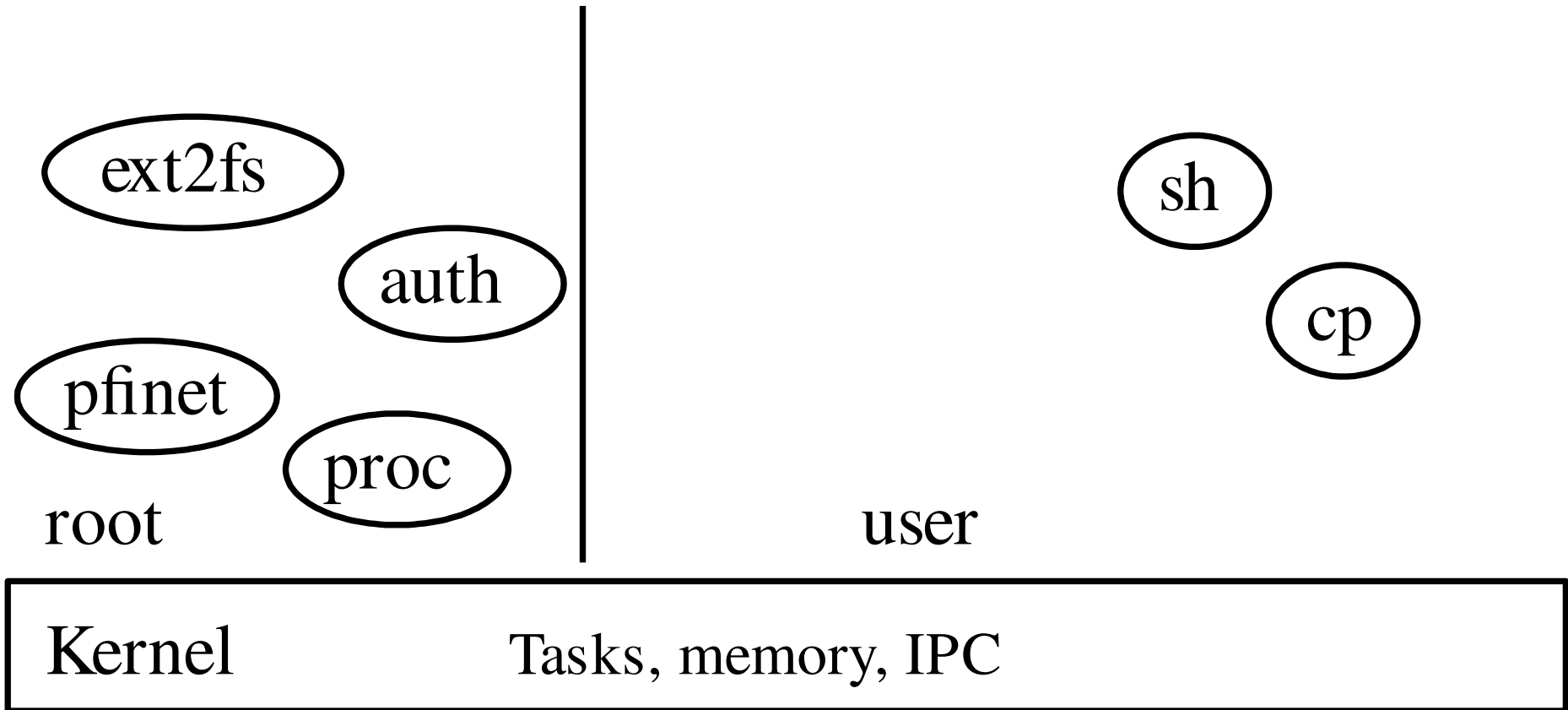
I.e.:

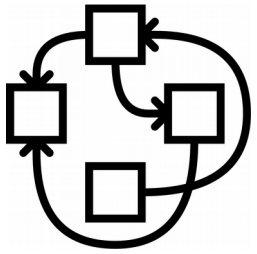
- Freedom from sysadmin!
  - WTH is fdisk/mke2fs/... hidden in /sbin?
  - I should be able to just work with my disk/network access
- Freedom to innovate
  - Experimental filesystem, personal work-flow, new kind of process combination,...
- Also provide freedom from misbehaving programs and drivers



# Micro-kernel layering

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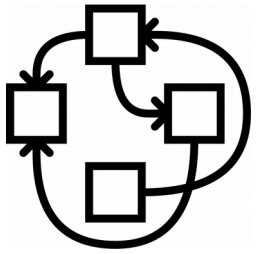




# Micro-kernel layering

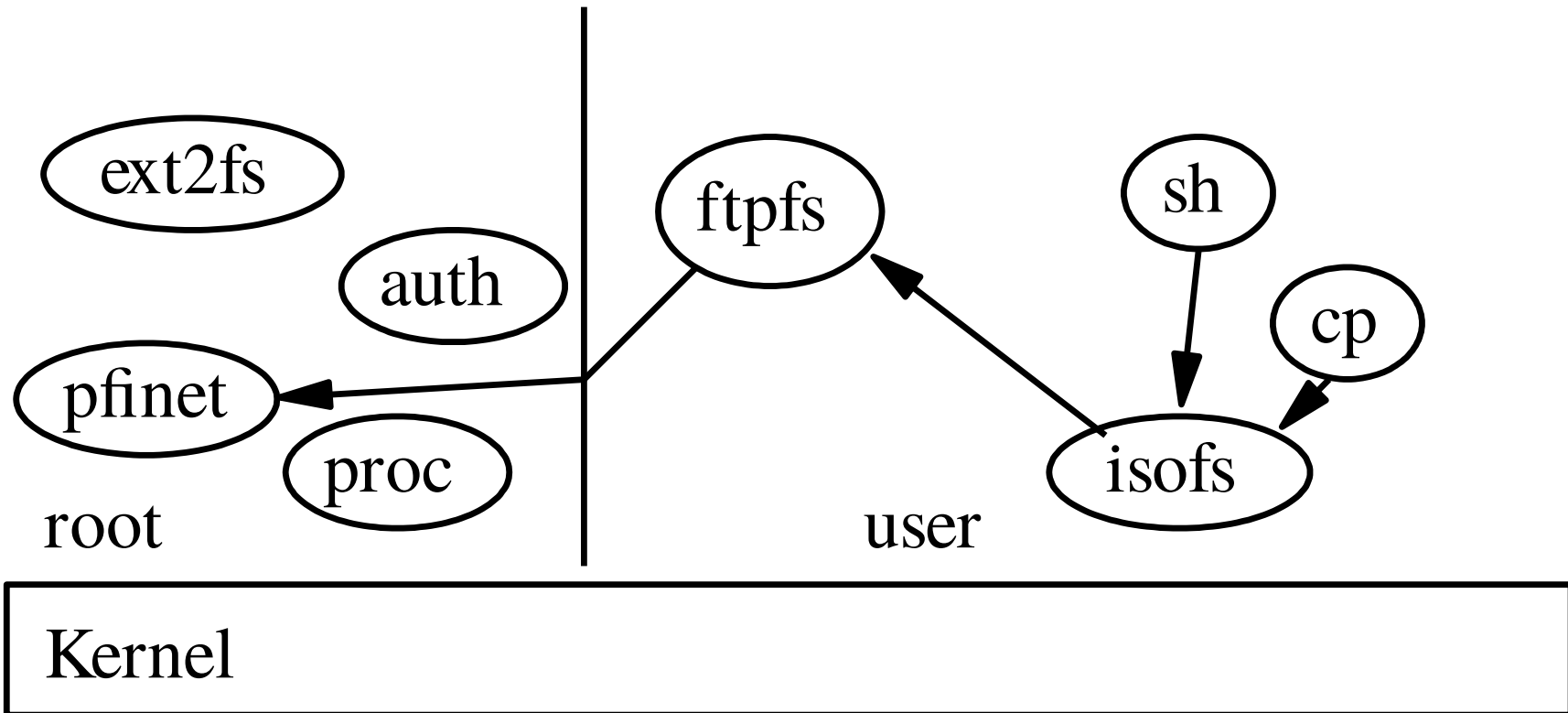
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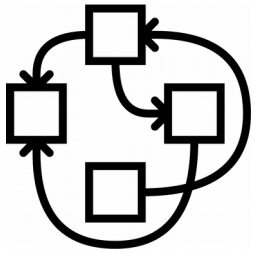
- Server crash? Not a problem
  - “Computer bought the farm” is just an error, not something-of-the-death
- Easier to debug/tune
  - Just run gdb, gprof, ...
- Can dare crazy things
  - The Hurd console has dynamic font support
    - See chinese support in pseudo-graphical mode (actually pure VGA textmode!) of Debian installer.
- Kernel only handles Tasks, memory, IPC



# Hurd possibilities

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# Hurd possibilities

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```
€ settrans -c ~/ftp: /hurd/hostmux /hurd/ftpfs /
```

(just once for good)

```
€ settrans -a ~/mnt /hurd/iso9660fs  
~/ftp://ftp.gnu.org/old-gnu/gnu-f2/hurd-F2-main.iso
```

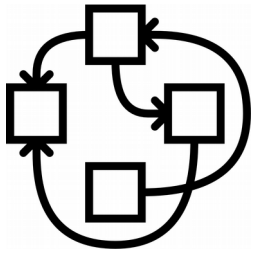
```
€ ls ~/mnt
```

```
README-or-FAIL
```

...

- Only downloads what is needed.
- Can be permanently stored in ext2fs

```
€ settrans ~/.signature /hurd/run /usr/games/fortune
```



# Example: interpose TCP/IP stack

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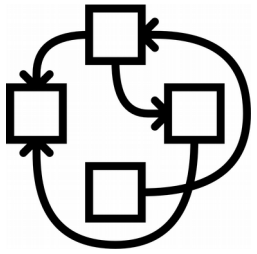
```
€ settrans -ca $HOME/servers/socket/2  
  /hurd/pfinet -i $HOME/servers/tun0
```

```
€ openvpn ... $HOME/servers/tun0 &
```

```
€ remap /servers/socket/2  
  $HOME/servers/socket/2
```

```
€€€ wget www.gnu.org
```

- My own translator
- Can plug my own VPN software
- Only wget accesses it (well, the shell too :) )



## But also

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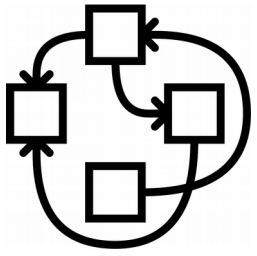
```
€ remap /bin/sh $HOME/bin/sh
```

```
€ remap /bin $HOME/unionbin
```

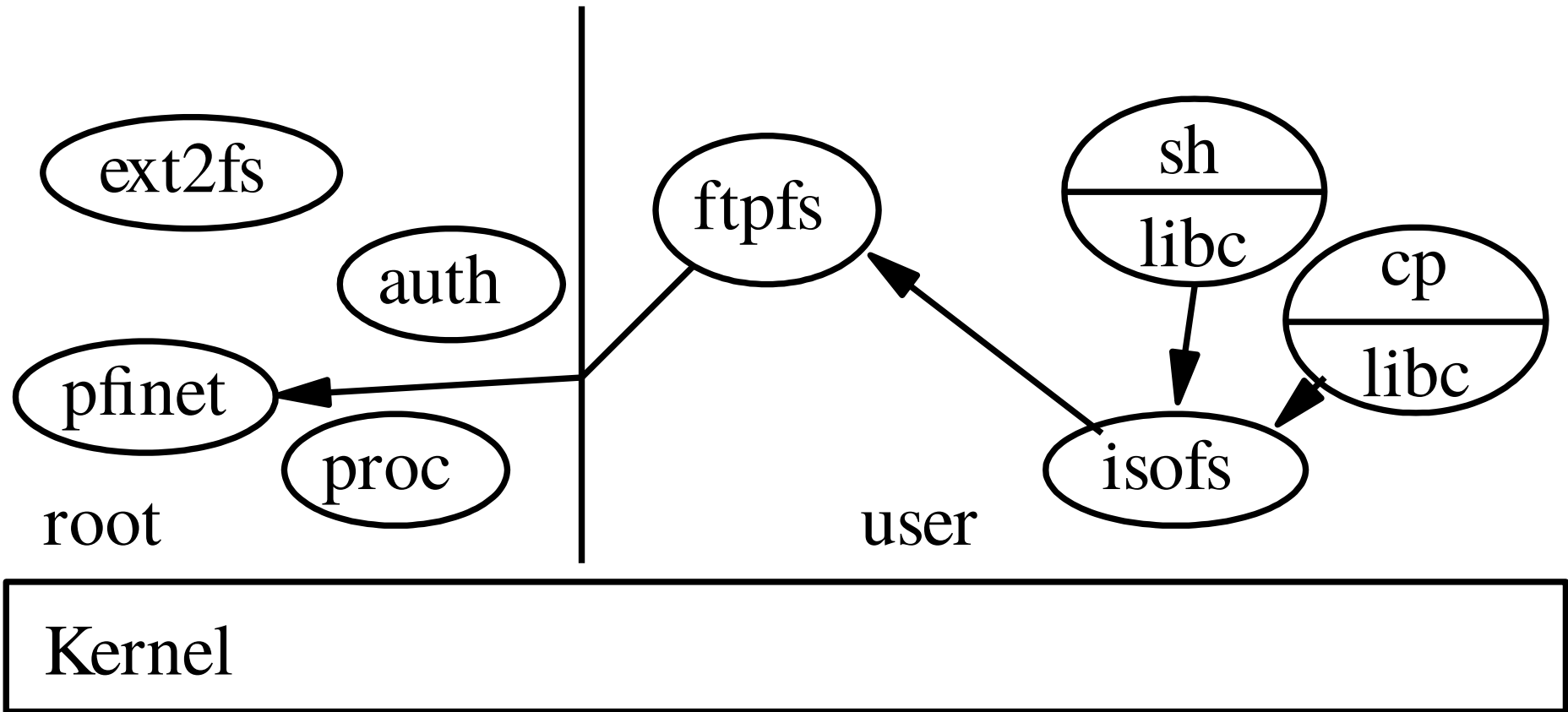
...

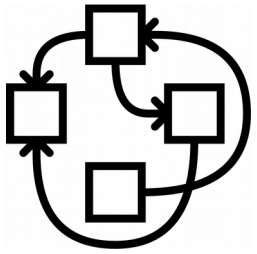
- Check out Stow/Nix/Guix!





# How does it work?

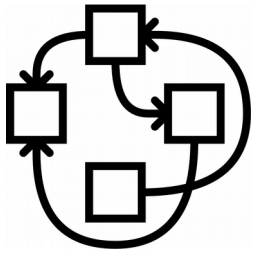




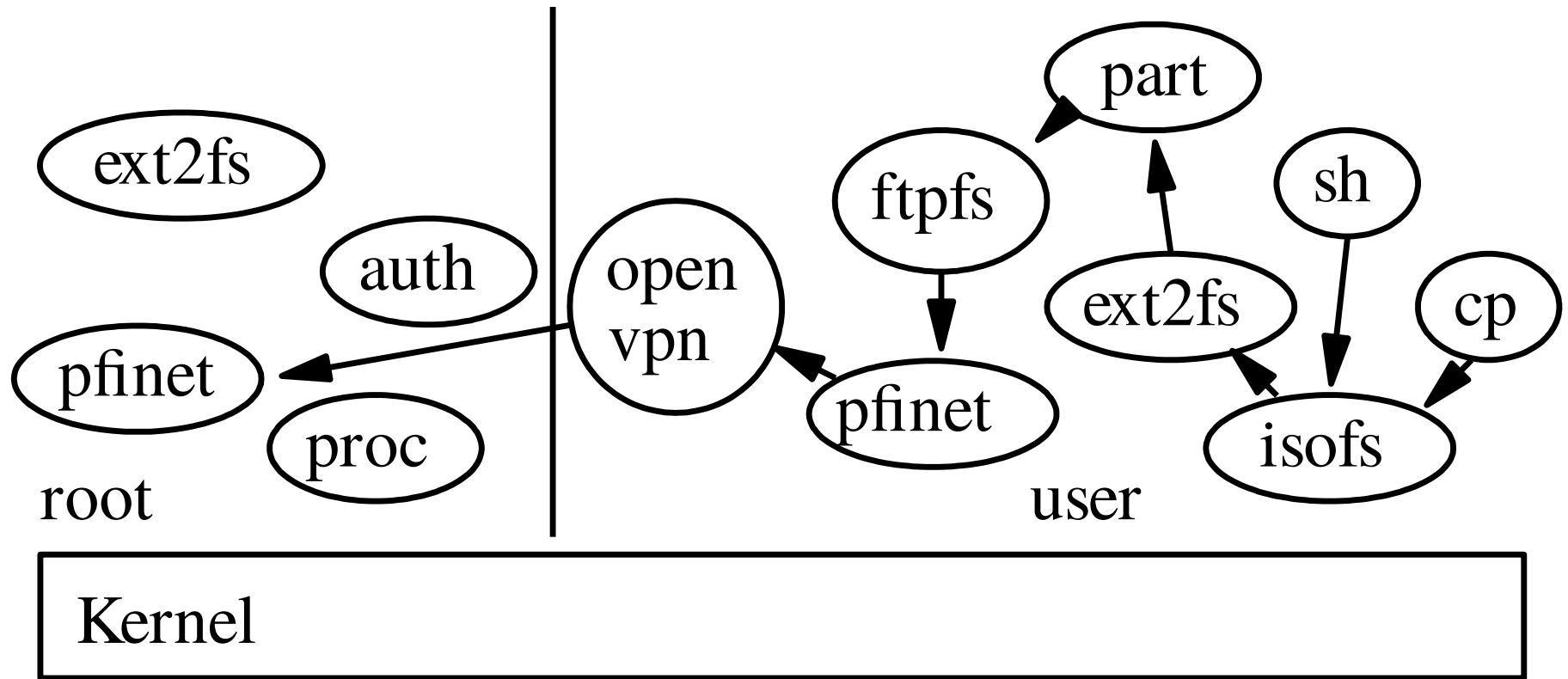
# Rationale

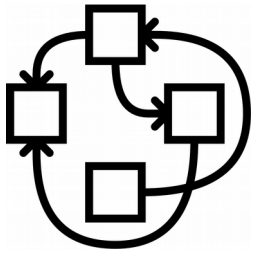
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- **Everything** is an (interposable) RPC
- Translators exposed in the FS
- The user gets to decide what/how to interpose
  - Without need for costly ptrace or fragile libc symbols interposition.
  - **Native** fakeroot/chroot
  - Fully virtualized and fine-grained interface
- Just need to use what's provided by the admin, e.g.
  - \$HOME/
  - TCP/IP stackand pile over it

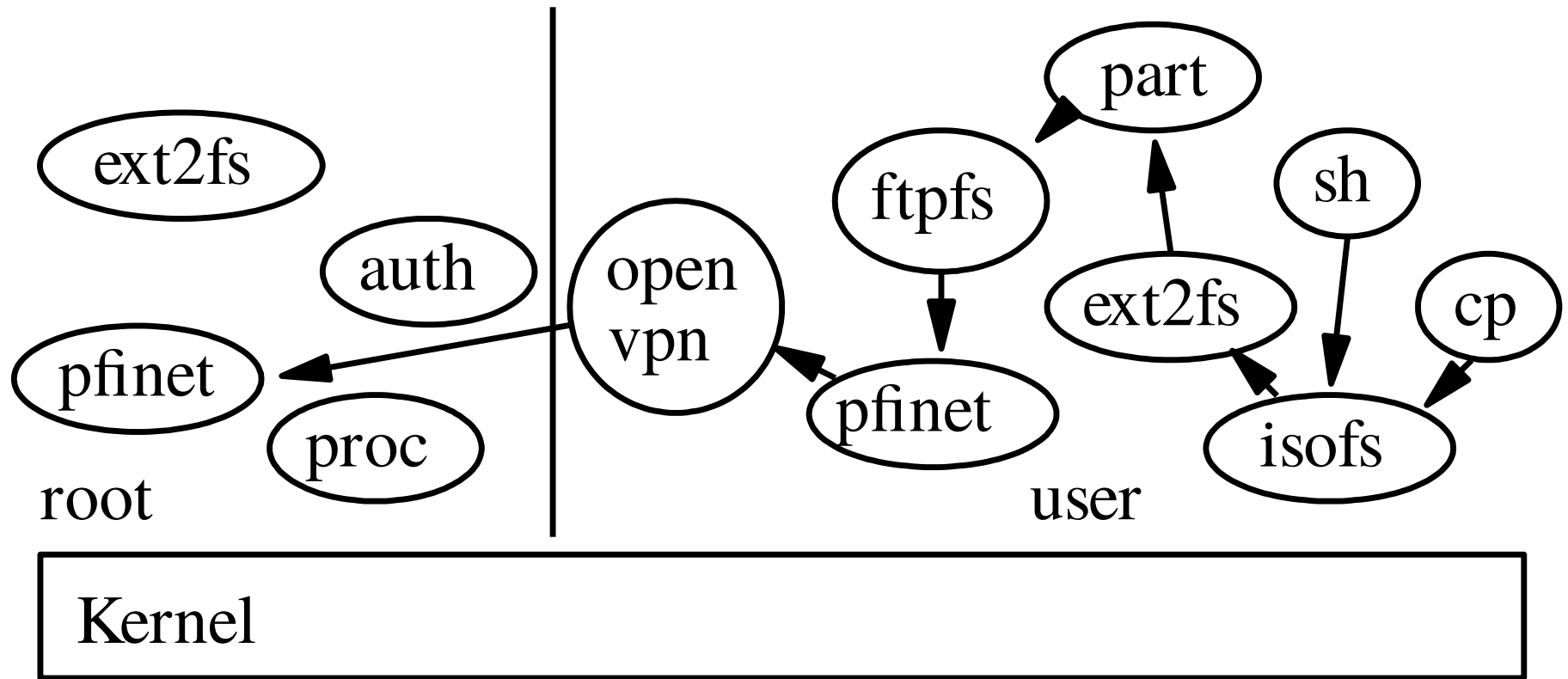


# Hurd possibilities (cont'ed)

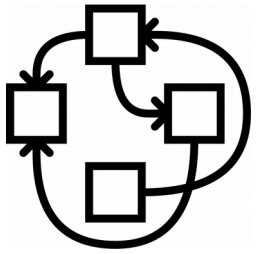




# Hurd possibilities (cont'ed)



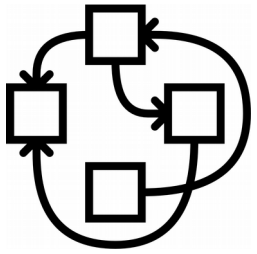
i.e. ISO image inside a partitioned disk image  
on ftp over a VPN



# Porting packages to hurd-i386

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- This is essentially a POSIX system
  - So portable programs should just work fine
- Top dumb issues
  - Not linux or BSD? `#include <windows.h>`
  - Have `mach.h`? Must be MacOS
  - `make -j $(grep ... /proc/cpuinfo) → make -j`
  - `#include <linux/limits.h>`
  - hardcoded `errno` values
  - Missing `-lpthread`, `-ldl`, `-lX11`, ...
- See Hurd porter page's developer corner
- And `PATH_MAX` not defined, as allowed by POSIX...

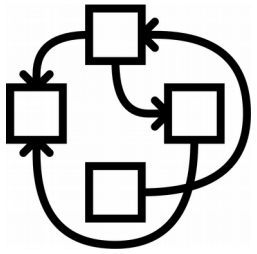


# PATH\_MAX is evil for you

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## Fragile semantic in POSIX

- Never meant to mean “reasonable size for a buffer containing a file name”
  - Linux' 4096 : a whole page, a whole TLB entry !
- Paths can actually be longer
  - “hidden”, ”protected” files?!
- Does that include the trailing \0? (not so clear in POSIX...)
  - Does your code actually properly handle that?
- A can of worms that nobody really tests...

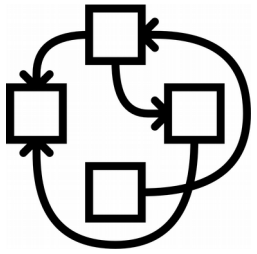


# Current State

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## Hardware support

- i686
- start of 64bit support
  - Kernel boots completely, now missing RPC 32/64bit translation
- DDE Linux 2.6.32 drivers layer for network boards
  - In userland netdde translator!
- IDE, Xorg, ...
- AHCI driver for SATA
- Xen PV domU
  - Required GNU Mach changes only
- Preliminary sound support through userland Rump
- No USB yet



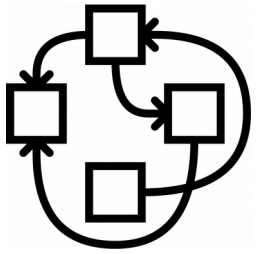
# Current State

---

## Software support

- Quite stable
  - Have not reinstalled boxes for a decade.
  - Debian buildbots keep building packages, no hang after weeks!
- ~81% of Debian archive builds out of tree
  - XFCE, almost gnome, almost KDE
  - Firefox (aka iceweasel), gnumeric, ...
- Standard *native* Debian Installer



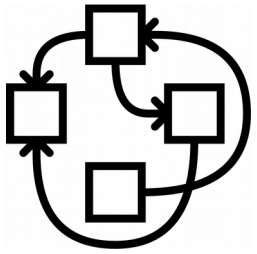


# Recent work

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Special thanks to Justus Winter!!

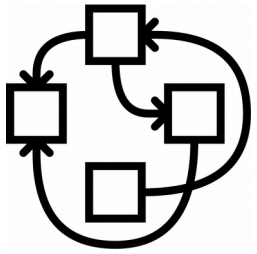
- Init system decoupled
  - Allows to use standard Debian sysvinit scripts!
  - Using dmd for Guix & such
- Distributed mtab translator
- Various optimizations
  - Protected payloads
  - Lockless implementations
  - Paging management
  - Message dispatch
- Valgrind start-of-port



# Releases

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- Nice 0.401 release on April 2011.
- Arch Hurd LiveCD release on August 2011.
- Released Debian-unofficial
  - wheezy/sid snapshot CDs on May 2013 \o/
  - jessie/sid snapshot CDs on May 2015 \o/



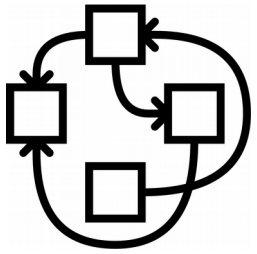
# Removal from ftp-master

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- Due since many years
- Not really useful to mirror all over the world anyway
- But beware of consequences
  - buildd.debian.org able to get fed from debian-ports?
    - Scheduled binNMUs for transitions
    - Losing this would be very tedious for ports maintainers
    - Exposure in e.g. <http://buildd.debian.org/yourpackage>
  - Toolchain version upgrades (gcc, perl)
    - Give \$WHOEVER\_DOES\_IT accounts just to be able to check those?
- In short, managing to get most support without extra load?

Conversely, those would help ports currently on debian-ports

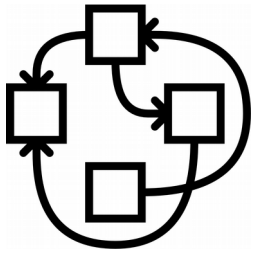
- Real status for Second-Class Citizens
  - BoF?



# Future work

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- Xen PVH support, X86\_64 support
- Language bindings for translators (ADA?)
- Read-ahead
- {hdd,sound,usb}dde?
- Rump drivers?
- GNU system: Guix/Hurd?
- Startup in scheme?
- Your own pet project?



# Thanks!

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- <http://hurd.gnu.org/>
- <http://www.debian.org/ports/hurd/>
- <http://people.debian.org/~mbanck/debian-hurd.pdf>
- The increasing irrelevance of IPC performance for microkernel-based Operating Systems

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.37.9653&rep=rep1&type=pdf>