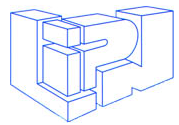
Marionnet — a virtual network laboratory

http://www.marionnet.org

Jean-Vincent Loddo
Luca Saiu

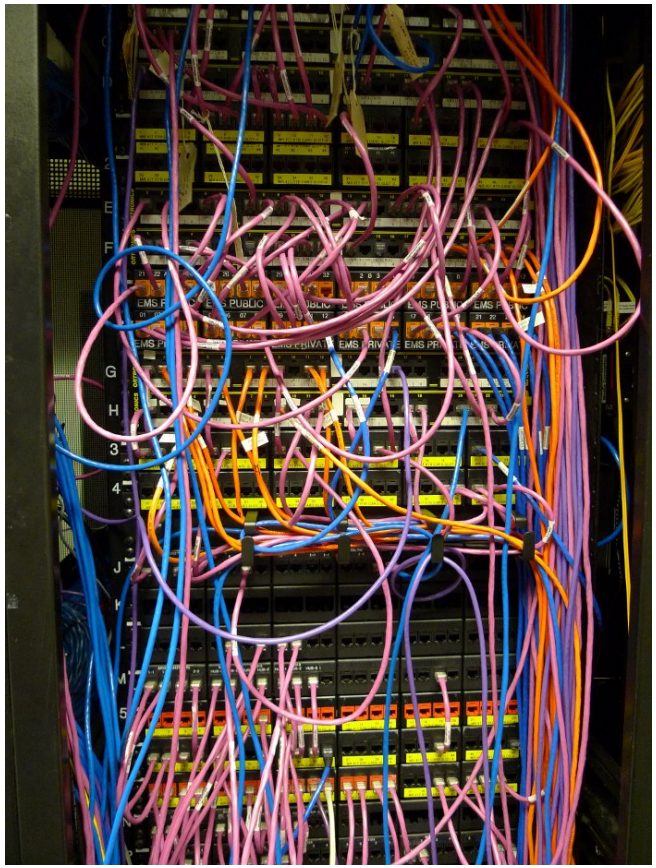
Laboratoire d'Informatique de l'Université Paris Nord (LIPN)

FOSDEM — Bruxelles, 2010-02-06



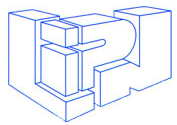
Network lab exercises in France: the old way

Twenty students sharing this:



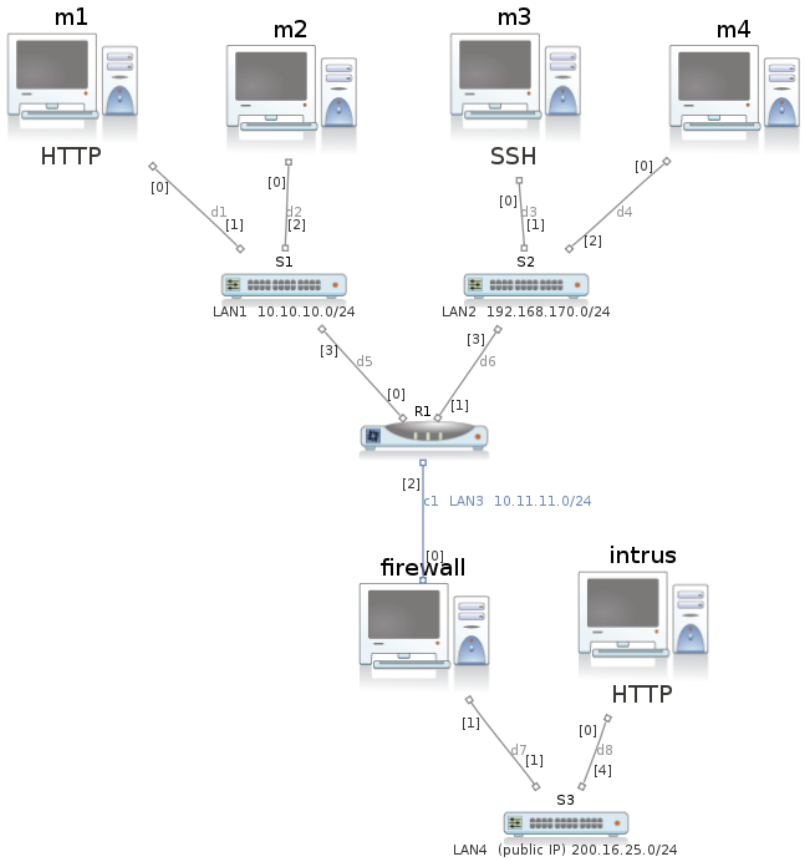
Picture by camknows: Attribution-NonCommercial-ShareAlike 2.0 Generic:

http://www.flickr.com/photos/camknows/3984879518



Network lab exercises in France: the new way

Each student running a virtual network:



From a real 3-hour exam (routing, firewall, SNAT, DNAT)

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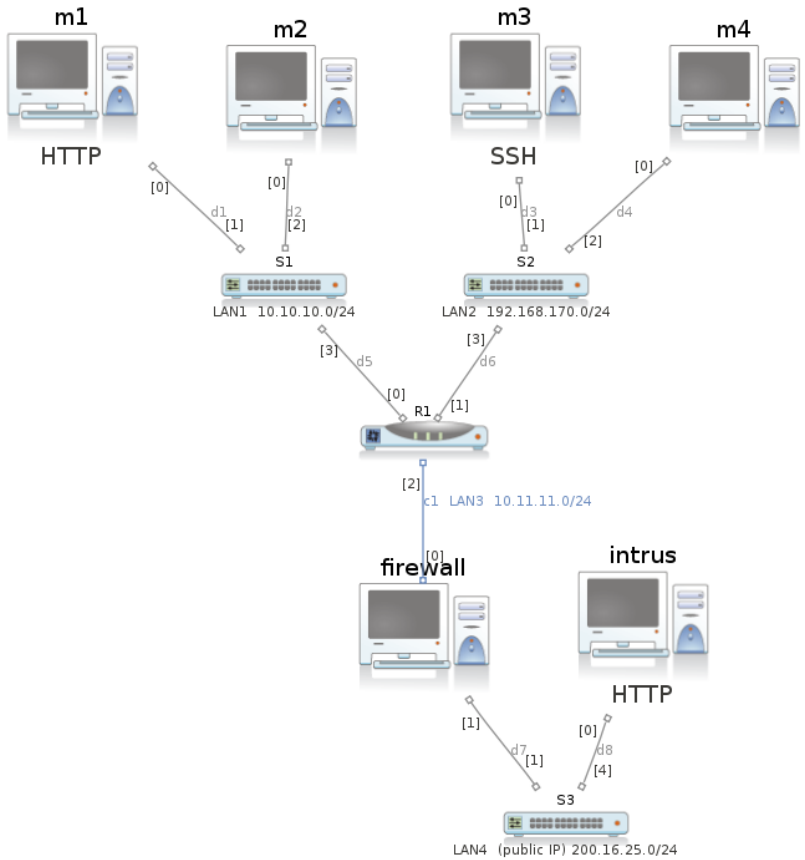

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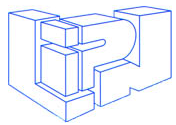
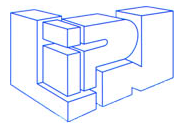


Simulate faithfully

Simulate a whole network (*computers*, routers, switches, cables, ...)

- For teachers: sharing exercises
- For students: working at home
- **Dynamically** changing the network
  - Adding/disconnecting cables
  - Adding/disconnecting routers, switches, computers, ...
  - **Hot** changes... the rest of the network runs!
  - Gateway to the host network



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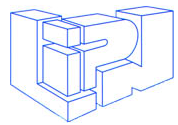

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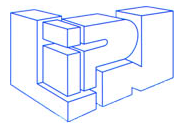

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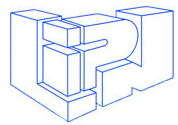
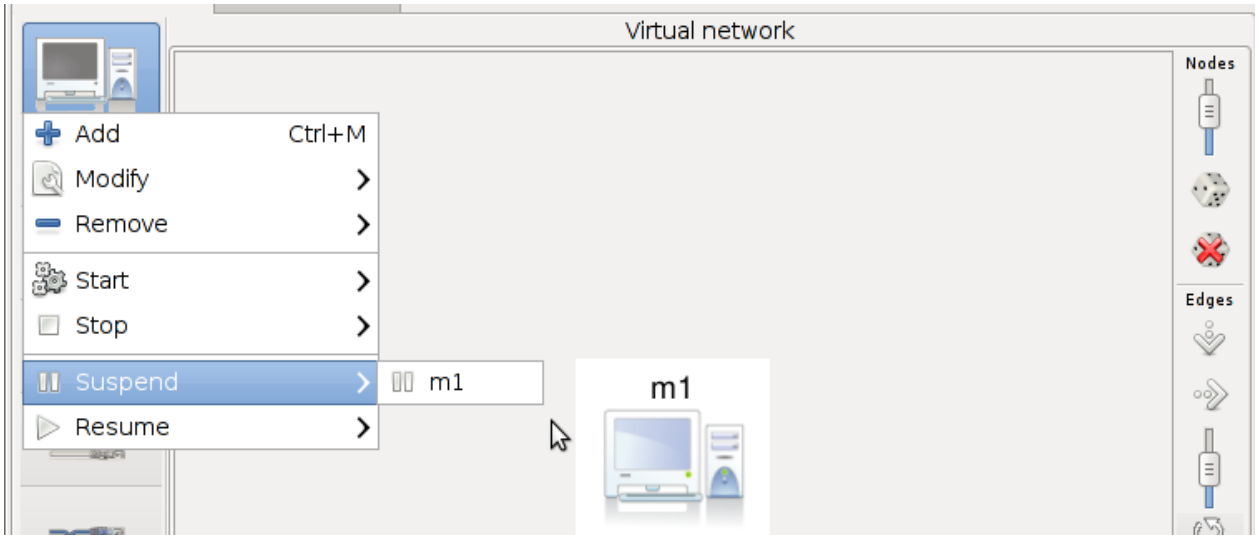
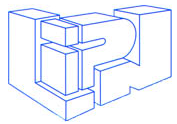


Do *more* than real hardware

- *Pause* devices (nice for routing tests)
- Save filesystem deltas
- *Reversible* filesystem changes
- *Break* virtual hardware whenever you want
  - How to explain reliability in TCP/IP? With *faulty cables*!





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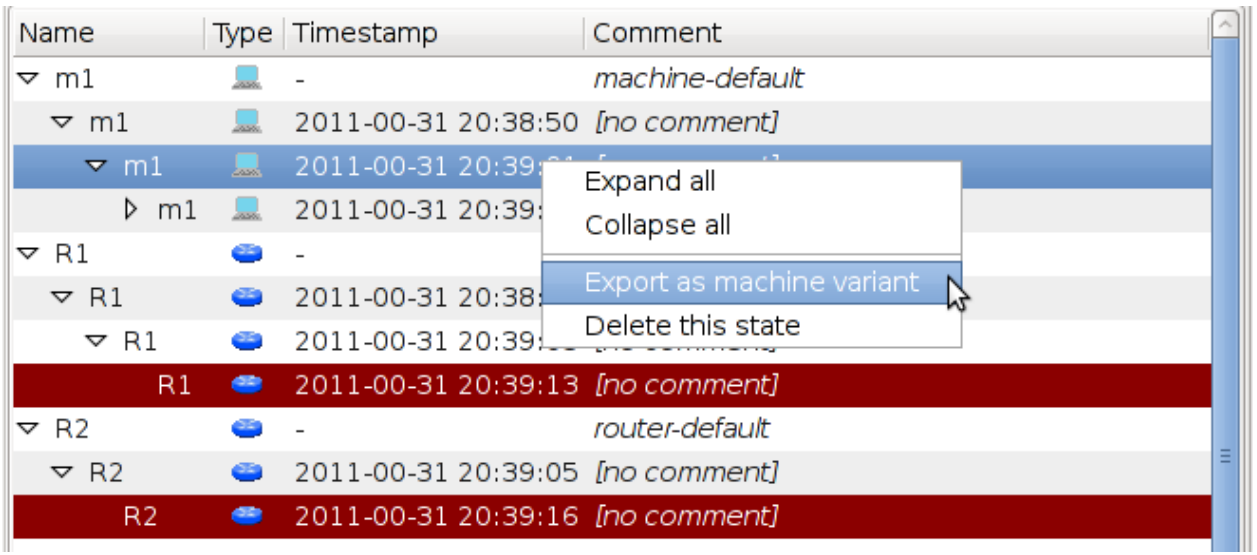

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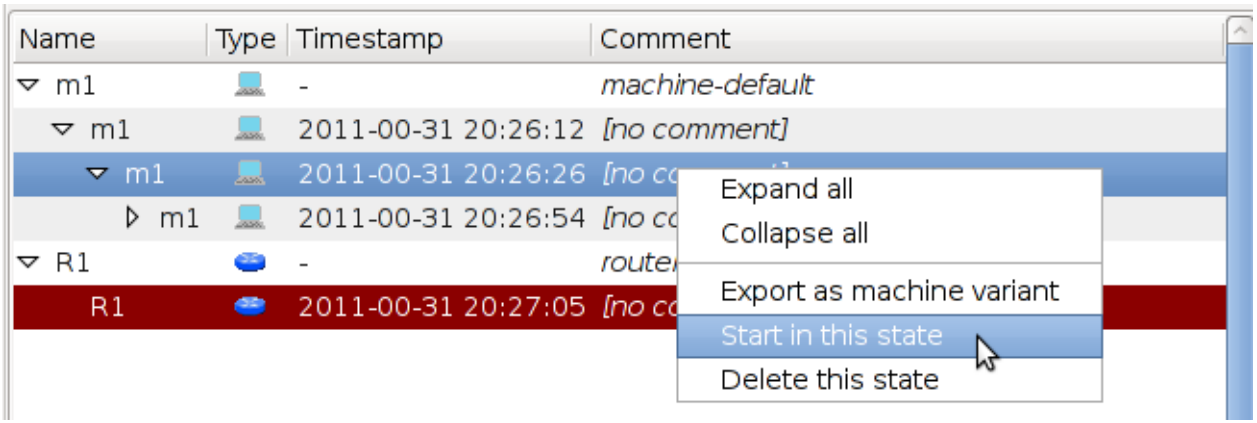

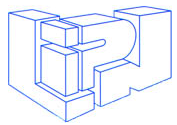

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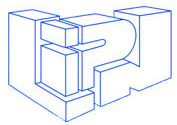

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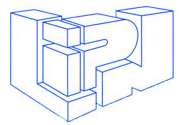

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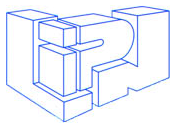
Virtual network

Name	Type	Loss %	Duplication %	Flipped bits %	Minimum delay (ms)	Maximum delay (m
m1						
eth0						
inward		0	0	0	0	0
outward		0	0	0	0	0
m2						
eth0						
inward		0	0	0	0	0
outward		0	0	0	0	0
eth1						
inward		0	0	0	0	0
outward		0	0	0	0	0
c1						
to m1 (eth0)		20	0	0	0	0
to m2 (eth0)		0	0	0	0	0



Friendly graphical interface

Students are our main target

- ...including first-year students
- ...including *bad* students

Don't scare them

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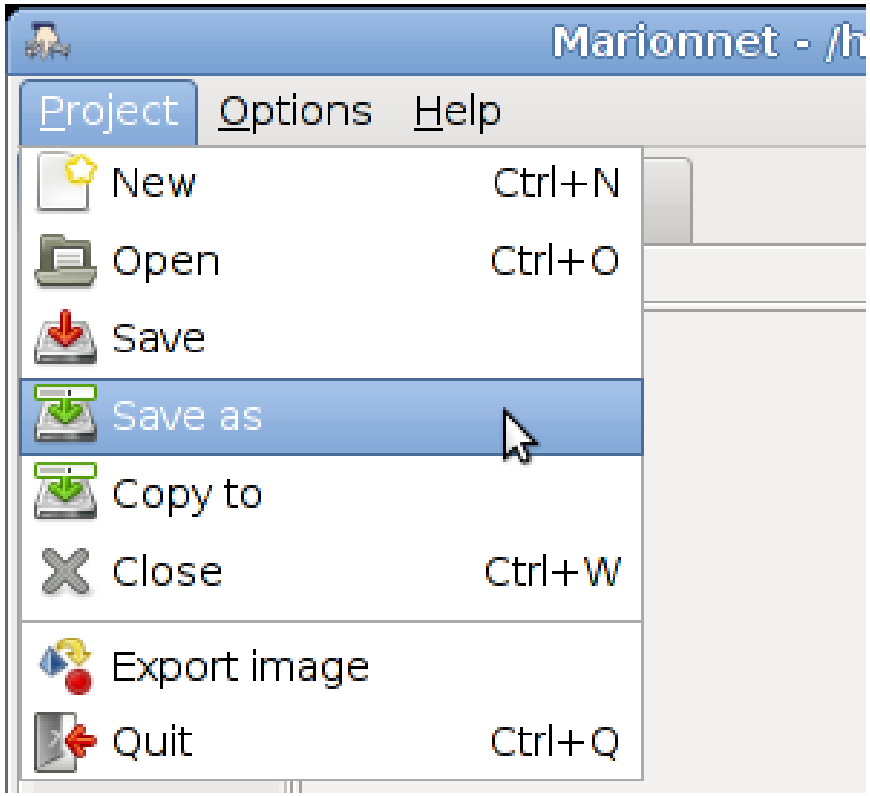
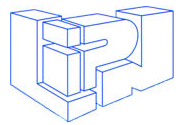
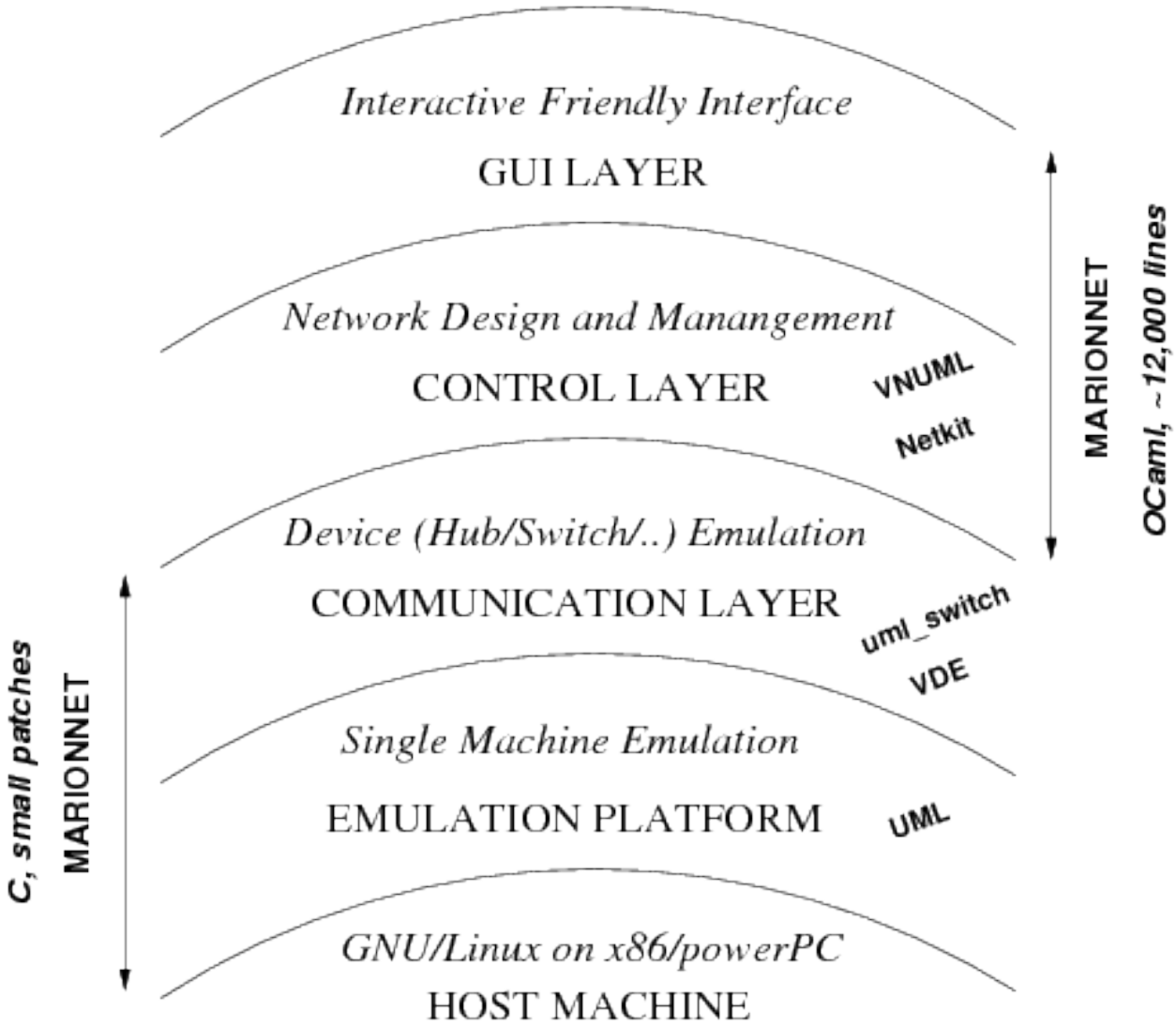


Wanna see it?

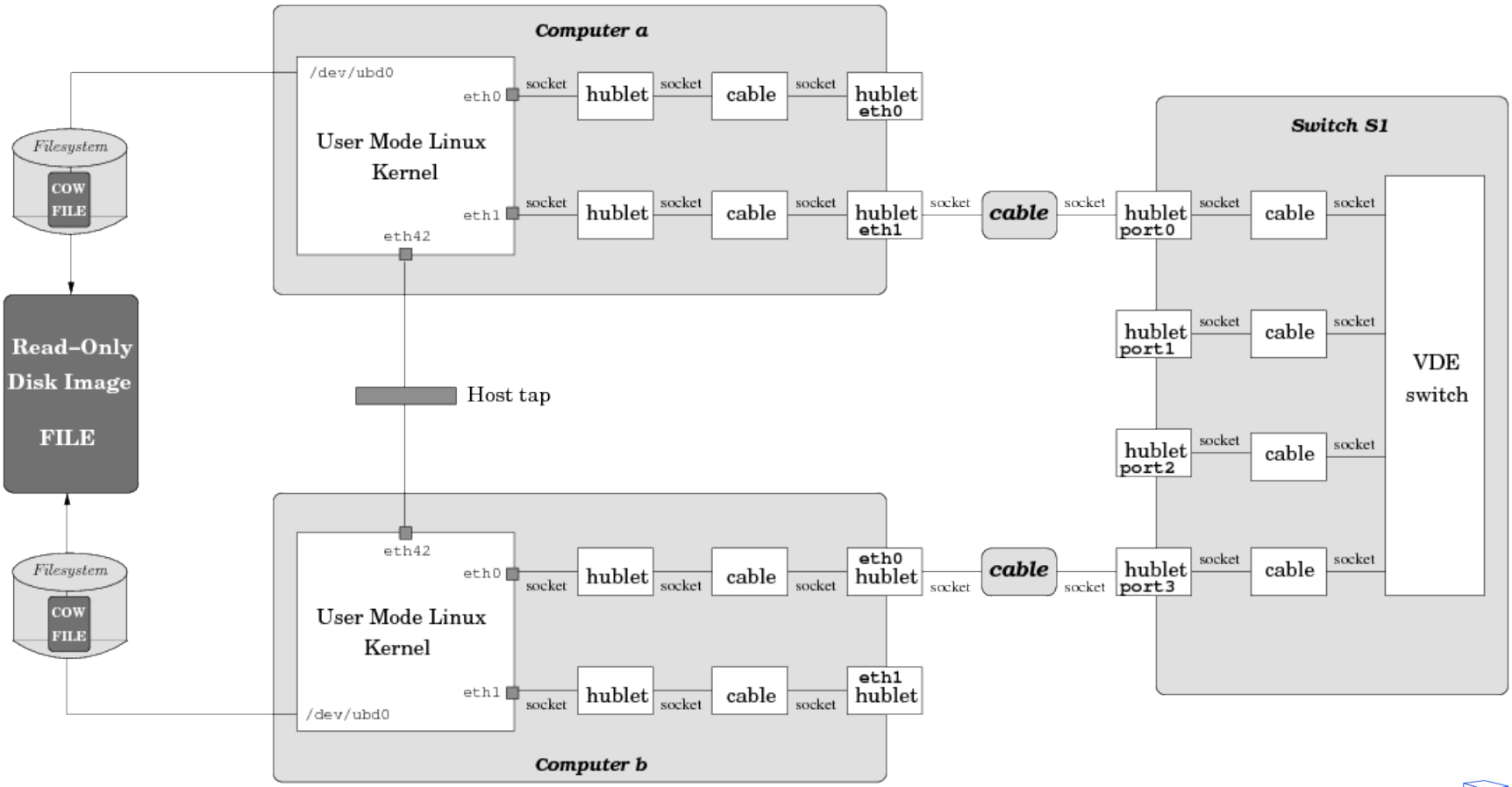
[Screencast]



Architecture



The network emulation level



Strongly *concurrent* code, which must be *fault-tolerant*

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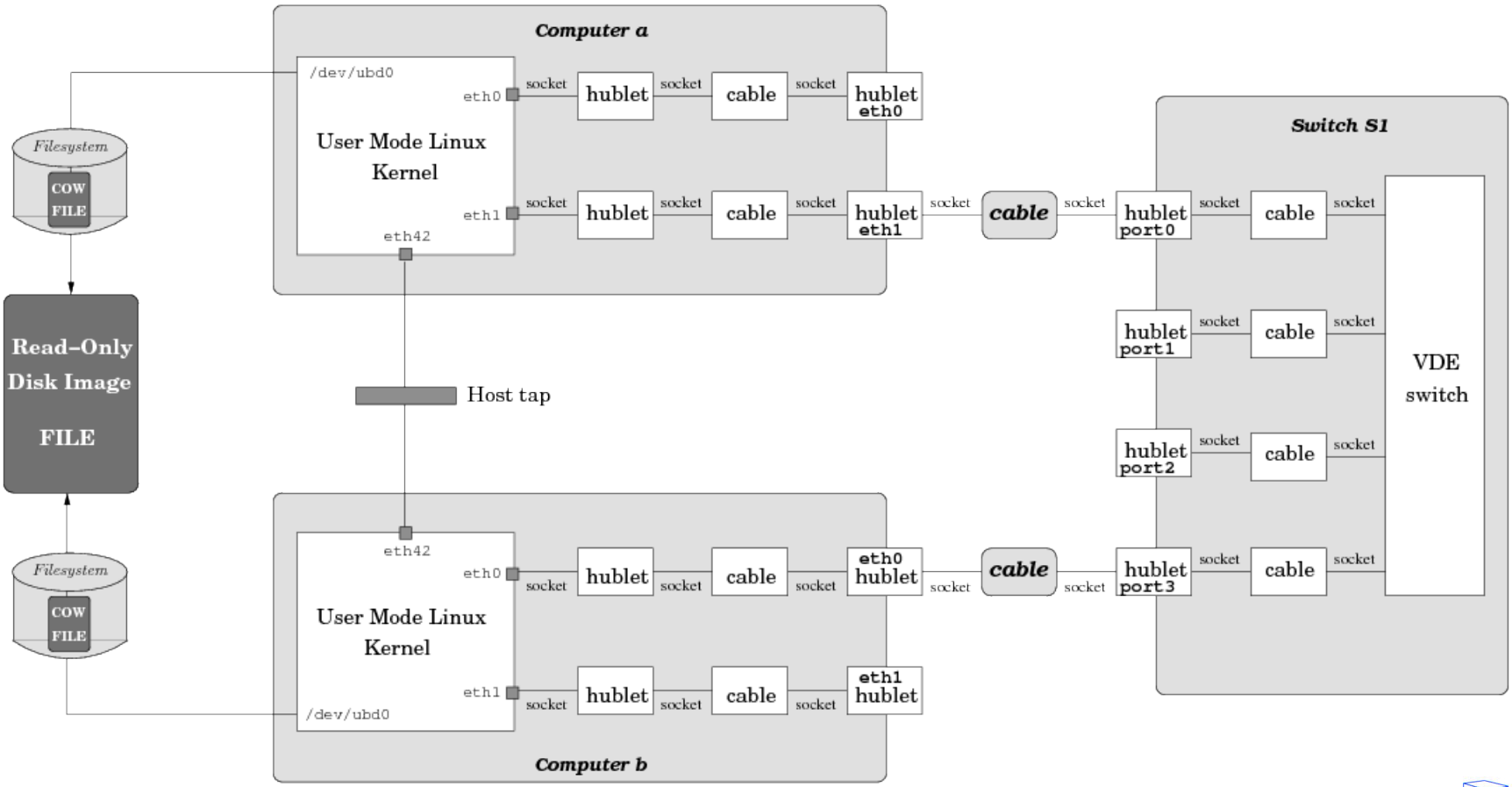
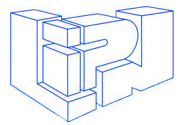


Strongly *concurrent* code, which must be *fault-tolerant*

We rely on...

- *VDE*, heavily [with my code for LED blinking :-)]
- *UML*, not so heavily; with some work we could support other virtualization or simulation engines. But I kinda like UML.
- *graphviz*, for generating the network graph picture
- Several standard Unix utilities...
- Gtk
- Glade (but we want to get rid of it)
- OCaml (compile-time only)
- (an early prototype relied on Netkit)

Lots of dependencies; we provide a script making Marionnet easy to compile from sources, including its dependencies



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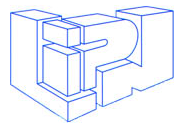

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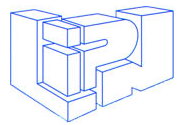

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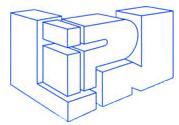

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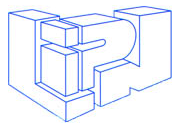


Cool hacks, including a kernel patch

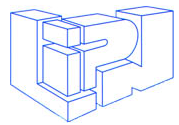
[Ghostification screencast]

...and there's more:

Status Report: Marionnet — How to Implement a Virtual Network Laboratory in Six Months and Be Happy, *Jean-Vincent Loddo, Luca Saiu, 2007 ACM SIGPLAN Workshop on ML*.

(It's on my home page).

...and the sources contain otherwise undocumented major wizardry



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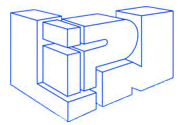

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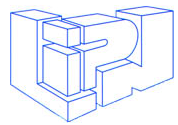
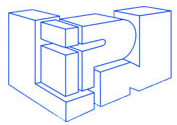


Wanna help?

Language	Status
Arabic	
Brazilian Portuguese	
French	
German	
Italian	
Portuguese	
Romanian	
Russian	
Spanish	
Turkish	

Translating is an easy way to contribute.



Other ways to contribute

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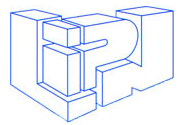
- Play with Marionnet and report any problem
- Can you code in OCaml...?



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(and we're on launchpad).