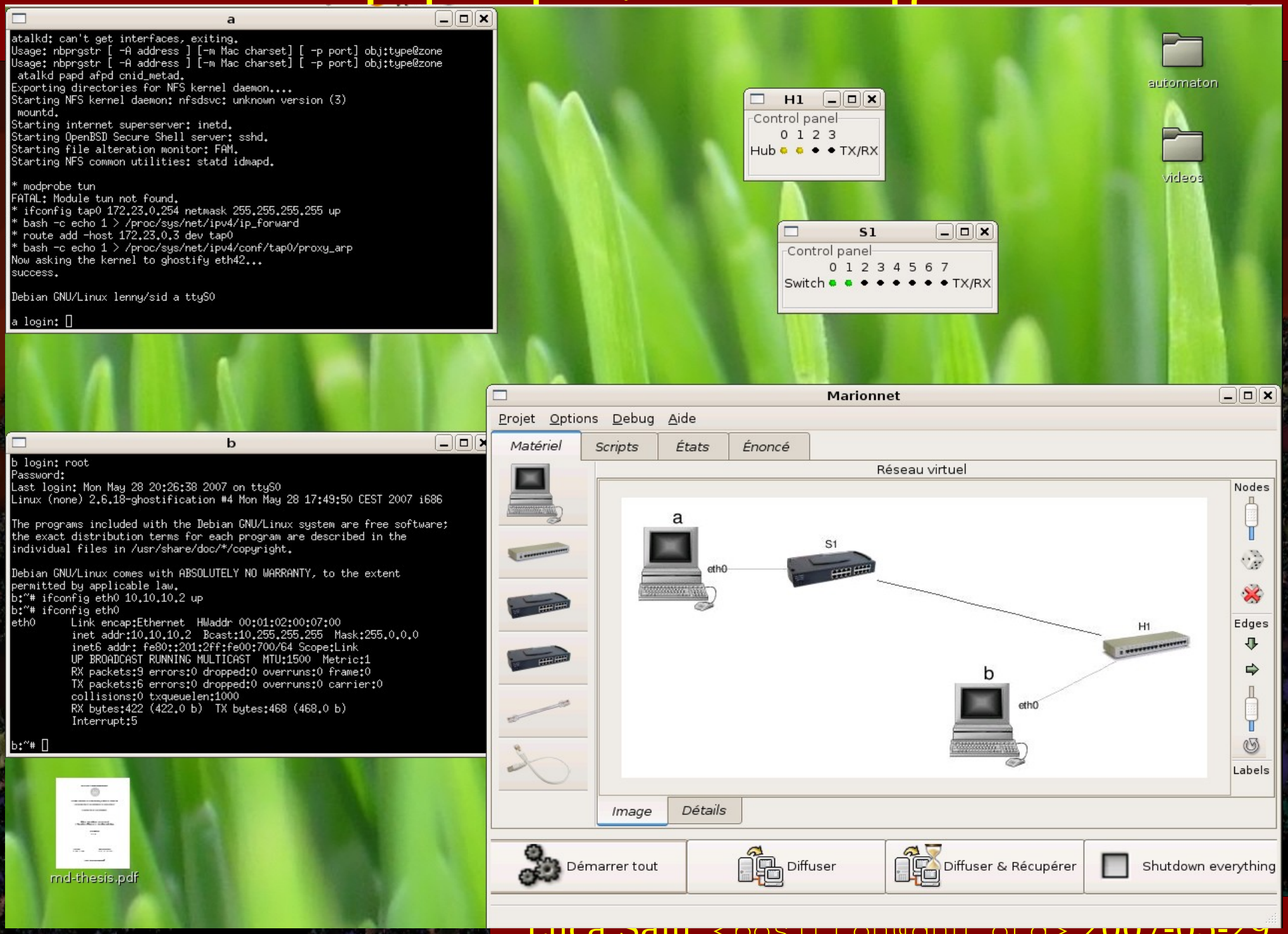
A quick overview of

epsilon
- a functional language implementation -

LCR

LIPN - Université Paris 13

Luca Saiu <positron@gnu.org> 2007-05-29


a
atalkd: can't get interfaces, exiting.
Usage: nbprgstr [-A address] [-m Mac charset] [-p port] obj:type@zone
Usage: nbprgstr [-A address] [-m Mac charset] [-p port] obj:type@zone
atalkd papd afpd cnid_metad.
Exporting directories for NFS kernel daemon....
Starting NFS kernel daemon: nfsdsvc: unknown version (3)
mountd.
Starting internet superserver: inetd.
Starting OpenBSD Secure Shell server: sshd.
Starting file alteration monitor: FAM.
Starting NFS common utilities: statd idmapd.
* modprobe tun
FATAL: Module tun not found.
* ifconfig tap0 172.23.0.254 netmask 255.255.255.255 up
* bash -c echo 1 > /proc/sys/net/ipv4/ip_forward
* route add -host 172.23.0.3 dev tap0
* bash -c echo 1 > /proc/sys/net/ipv4/conf/tap0/proxy_arp
Now asking the kernel to ghostify eth42...
success.
Debian GNU/Linux lenny/sid a ttyS0
a login:
H1
Control panel
0 1 2 3
Hub
TX/RX
S1
Control panel
0 1 2 3 4 5 6 7
Switch
TX/RX
automaton
videos
b
b login: root
Password:
Last login: Mon May 28 20:26:38 2007 on ttyS0
Linux (none) 2.6.18-ghostification #4 Mon May 28 17:49:50 CEST 2007 i686
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
b:~# ifconfig eth0 10.10.10.2 up
b:~# ifconfig eth0
eth0 Link encap:Ethernet HWaddr 00:01:02:00:07:00
inet addr:10.10.10.2 Bcast:10.255.255.255 Mask:255.0.0.0
inet6 addr: fe80::201:2ff:fe00:700/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:9 errors:0 dropped:0 overruns:0 frame:0
TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:422 (422.0 b) TX bytes:468 (468.0 b)
Interrupt:5
b:~#
md-thesis.pdf
Marionnet
Projet Options Debug Aide
Matériel
Scripts
États
Énoncé
Réseau virtuel
a
eth0
S1
H1
b
eth0
Nodes
Edges
Labels
Image
Détails
Démarrer tout
Diffuser
Diffuser & Récupérer
Shutdown everything

GNU epsilon

A functional programming language

- Usable in practice...
- ...and also clean and minimal
- Efficient implementation
- Free software and part of the GNU Project

- Quite a long history
  - Started in 2001, implemented three times

Luca Saiu <positron@gnu.org> 2007-05-29

Why functional

An extremely interesting alternative paradigm:

- Very high-level
- Safe, when statically-typed
- Clean semantics: easy to reason about
- Challenging: efficient compilation is nontrivial

Why another language

Every powerful language has three mechanisms [...]*:*

- primitive expressions,
  which represent the simplest entities the language is concerned with,
- means of combination,
  by which compound elements are built from simpler ones, and
- means of abstraction,
  by which compound elements can be named and manipulated as units.

— Abelson and Sussman, SICP

- **All** the existing programming languages I know of leave to desire in their *means of abstraction*
- (but Lisp macros are a step in the right direction)

Better means of abstraction

User-definable:

- Macros — pattern-matching
- Global transforms — SPS, CPS
- Semantic *constraints* and *attributes* — type checking, type inference

- …and language “primitives” **definable in C**

epsilon

- epsilon is free software and part of the GNU Project

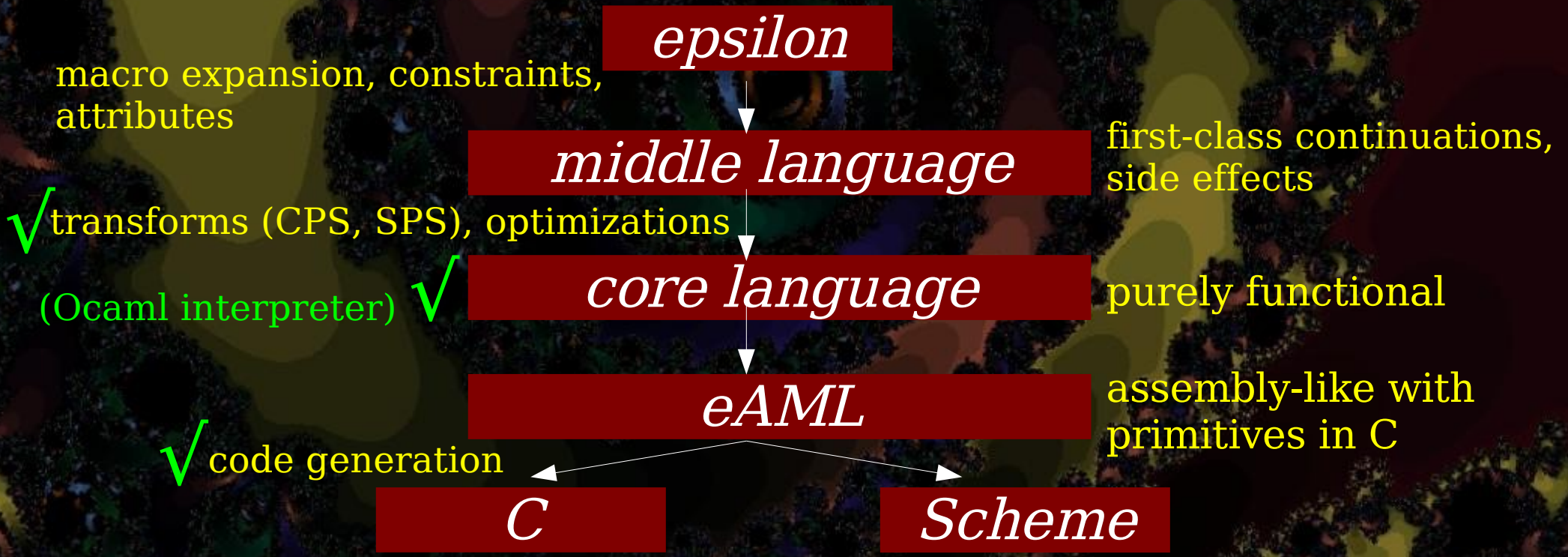
  (officially approved by Richard Stallman)

- As of now:
  - Currently implemented in C ~60,000 lines
  - Compilation into C code and bytecode interpretation
  - Programming tools: epsilonlex, epsilonyacc
  - “Usual” features: omega-order, first-class functions, modules...
  - Usable (ICFPc)

epsilon: future directions

"Stratified" implementation

- Compilation via source-to-source transforms...
- ...into a minimal *purely*-functional language...
- ...then into *very low-level* abstract machine code



- Bootstrapped via OCaml

For more information

For more information...

http://www-lipn.lipn.univ-paris13.fr/~saiu

http://www.gnu.org/software/epsilon

positron@gnu.org

saiu@lipn.univ-paris13.fr

Thanks.