

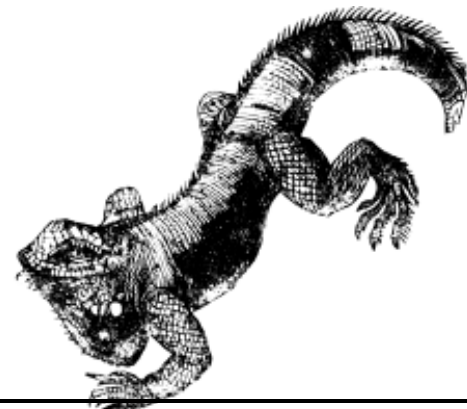
L4, Wombat, Skyeye and PLEB

Ben Leslie

`benjl@cse.unsw.edu.au|Ben.Leslie@nicta.com.au`

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linux.conf.au 2006 embedded miniconf



Who am I?

- Research engineer for NICTA's ERTOS program.
- UNSW PhD student.
- Other work includes user-level device drivers on L4 and Linux.
- Virtualisation on L4, Xen, User-mode Linux.
- Various google maps hackery.
- pyAnnodex - python bindings for Annodex.

<http://www.benno.id.au/>

What is NICTA?

Australia's ICT Research Centre of Excellence

- Creation of technology for use in society, the market, and the environment.
- Funded by federal, ACT and NSW state governments and ANU and UNSW.
- Provide educational opportunities.
- Help reduce ICT spending deficit.

<http://www.nicta.com.au/>

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What is ERTOS?

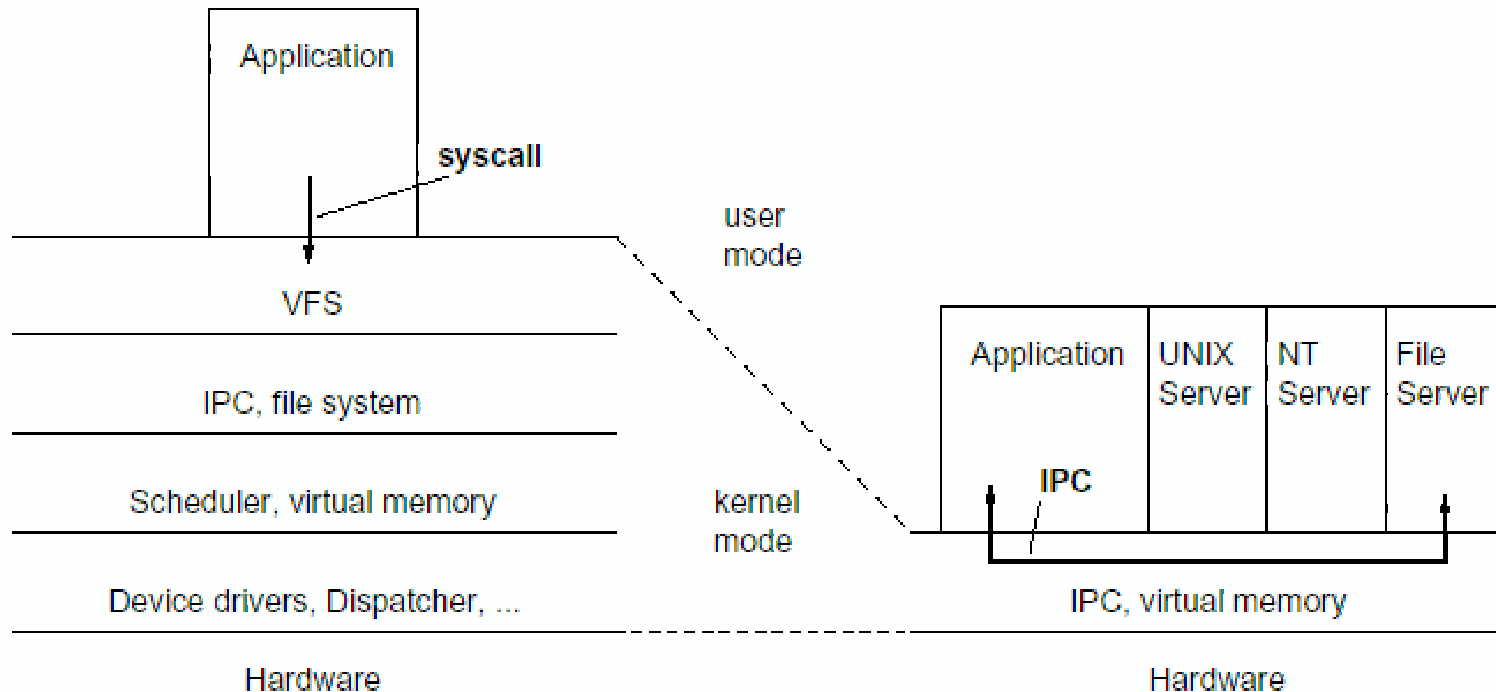
- Embedded, Real-time, and Operating Systems Program.
- Aim to produce reliable and trustworthy embedded software.
- Produce practical software, not just research outcomes.
- Dedicated to producing open source software.

<http://www.ertos.nicta.com.au>

- L4 microkernel
- Wombat
- Skyeye
- PLEB2

WHAT IS A MICROKERNEL?

- Provides mechanisms, not policy



- Small
10k LOC, 70kb binary
- Fast
< 300 cycle context switch, < 150 cycle IPC

ADVANTAGES OF A MICROKERNEL

- Smaller trusted computing base:
 - Robustness
 - Security
- Modularity

L4::NICTA-EMBEDDED

- An implementation of the L4 N1 specification.
- Based on the L4Ka codebase (<http://l4ka.org>).
- Written in C++ and assembler.
- BSD style license.
- Available from a wide range of architectures.
 - ARM, x86, MIPS
 - IA64, PowerPC, PowerPC embedded, Blackfin

<http://www.ertos.nicta.com.au/l4/>

L4 BASED EMBEDDED PROJECTS

Kenge

- Libraries: data structures, drivers, libc, L4 convenience libraries
- Build system: generate boot images for different platforms
- Tools: dite, Magpie IDL compiler, dd_ds1.py

Iguana

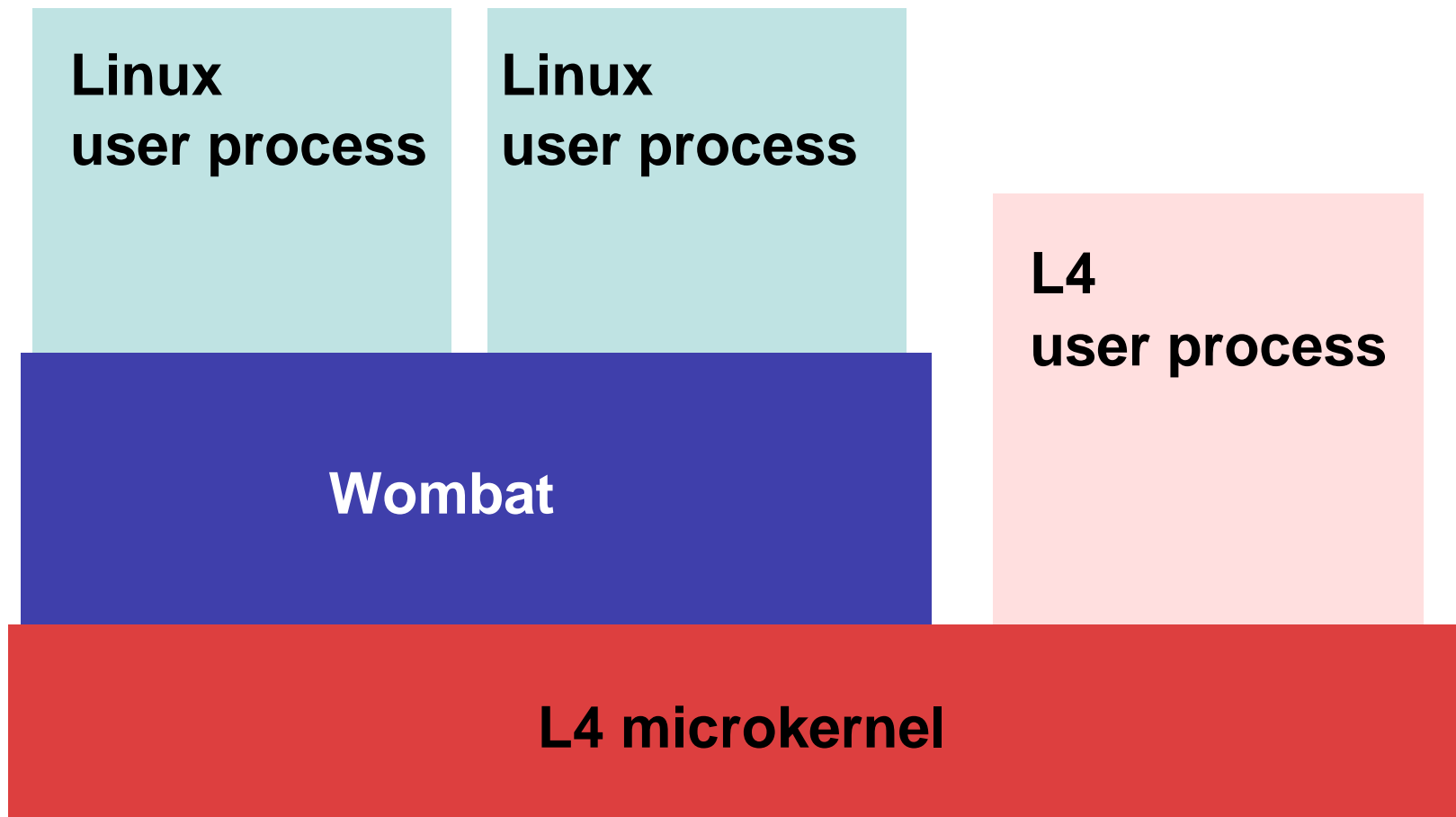
- An L4 based OS “personality”
- Designed for embedded systems
- Designed for running legacy systems
- Mungi derivative

Wombat

- An port of Linux 2.6 to Iguana
- Portable approach

<http://www.ertos.nicta.com.au/software/>

- L4 microkernel
- **Wombat**
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WOMBAT: RUNNING LINUX ON THE L4 μ KERNEL

MOTIVATION

Why would anyone want to use this?

- Real-time applications
- Robustness
- Security
- License issues
- Portability

<http://www.ertos.nicta.com.au/software/wombat/>

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SKYEYE: A FULL SYSTEM SIMULATOR FOR ARM

- Simulates full instruction set and peripherals.
- Based on ARMulator.
- Supports StrongARM and Xscale.
- GDB support. (Slightly buggy!)
- Primary developers from Tsinghua University, China.
- Many other developers from around the world.
- Cross-platform: Linux, Mac OS X, Windows.

<http://www.skyeye.org/>

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PLEB2

Pocket Linux Embedded Board

- Original PLEB project started in 1998 by Adam Wiggins.

Specs

- Intel Xscale PXA255 400MHz.
- SDRAM (32MB) and Flash (8MB).
- AVR microcontroller: remote reset, JTAG, measure power usage.
- Stackable daughter cards.
- 100mm x 70mm footprint (same as 2.5" harddrive).

Network/IDE/USB Daughter Board

- LAN91C11 Ethernet controller.
- SL81HS USB Host chip.
- IDE interface to memory bus.

<http://www.ertos.nicta.com.au/hardware/pleb/>

PLEB2 USES

- Power Management <http://www.ertos.nicta.com.au/research/pm2/>
- Sunswift <http://www.sunswift.com/>
- BlueSAT <http://www.bluesat.unsw.edu.au/>
- Frog recognition <http://www.cse.unsw.edu.au/~andrewt>