Making Closed Source UNIX Open Again

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This paper describes the work done to free old versions of UNIX from their closed source licenses, and examines the construction of the Apout simulator which can be used to run old UNIX executables.

Unix's Heritage to the Open Source Community

- Good design, elegant API
  - brk(), chdir(), chmod(), chown(), close(), creat(), exec(), exit(), fork(), fstat(), getuid(), link(), mkdir(), open(), read(), seek(), setuid(), stat(), time(), unlink(), wait(), write() by the end of 1971
- Ability to modify code of OS, libs, applications
- Ability to tailor your own environment
- Ability to distribute patches & improvements to the Unix community
  - Usenix conferences in 1970s, net.v7bugs newsgroup

Unix's License Changes

- Earliest license:
  - 'Here's your RK05, love Dennis'
- By 1975, universities could get Unix with reasonable license conditions
- By 1979, AT&T realised that Unix was a product, & tightened license restrictions
  - stopped the use of Unix to teach OS
- This had the effect of creating GNU
  - GNU's not Unix
- Also helped convince CSRG to decontaminate the 4BSD releases in the 1980s

Lobbying to Free the Old Unixes

- 1990s: could only buy a SysV license: $$$
- 1996: Steven Schultz & I began lobbying SCO for cheap/free licenses
  - Free was out of the question, said SCO
- 1997: On-line petition used to lobby SCO for cheap licenses
- 1998: With help from Dion Johnson at SCO, ‘Ancient UNIX’ licenses came out in March. Cost is US$100
- 2000: SCO decides to drop the $100, but requires users to agree to on-line license before access granted

SCO's Ancient Unix License: Open?

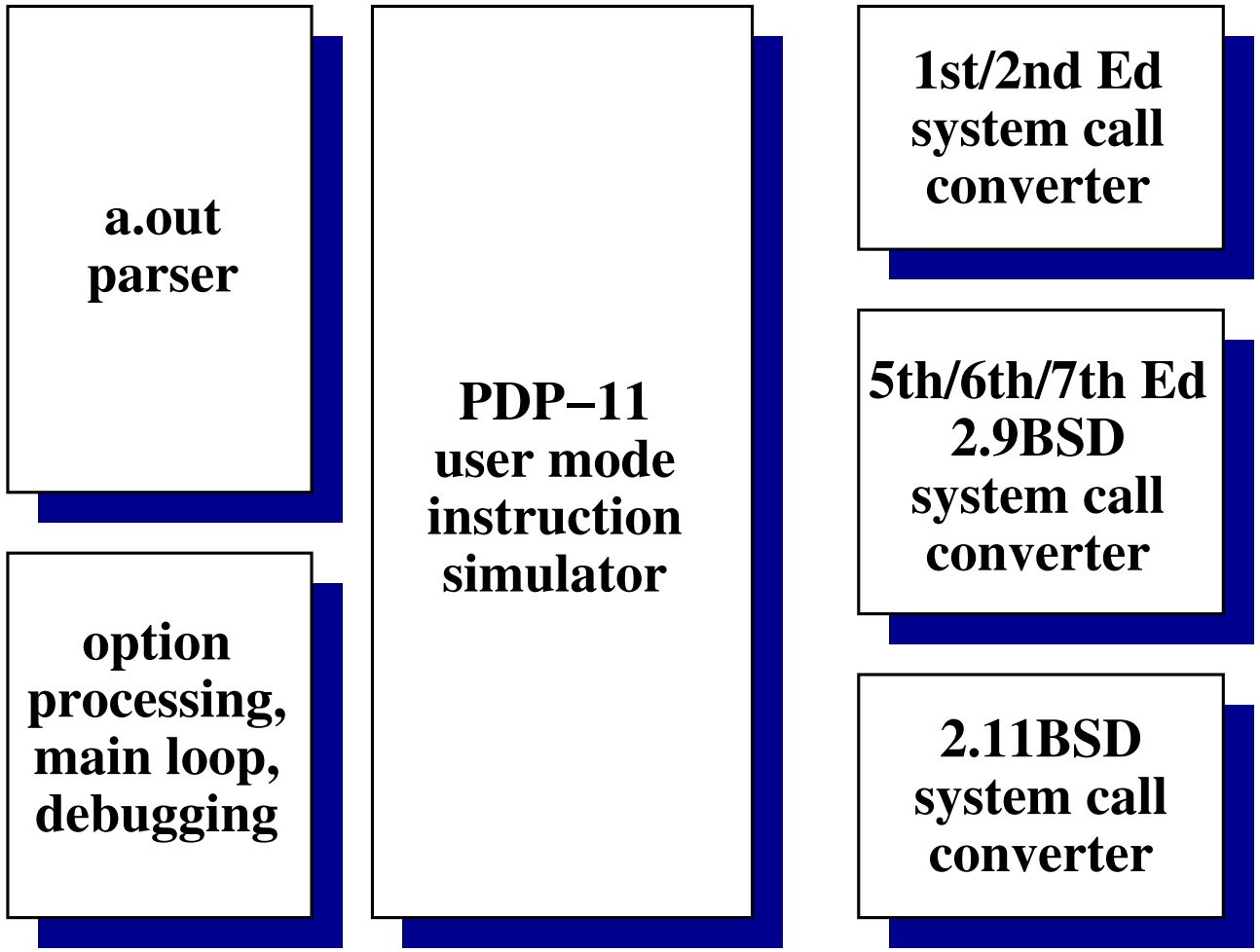
- Covers Unixes from 1st Edition up to System III, including 32V, but NOT System V
- Covers the contaminated portions of derived systems, e.g 2BSD, 4BSD, Ultrix
- Right to use, modify, compile the source code
- Right to distribute source code, modifications, binaries, but only to other license holders
- Use & distribution must be non-commercial

- Not yet completely Open Source

Apout: Resurrecting Ancient Unix

- Any source code useless unless you can use & modify it. This includes old Unix source 8-)
- Several simulators for old Unix platforms:
  - simh, Ersatz-11, P11
- Drawbacks: simulate disk drives & their layout, kernel-mode instructions.
  - slow, cannot directly read files on simulated disks
- Apout simulates user-mode PDP-11 instructions, & converts syscall requests to native syscalls

Apout's Design



- Prepends $APOUT_ROOT to absolute filenames
- Forks & execs a.outs as required
- Can also exec native binaries

Apout: Implementation Issues

- Conversion of a full PDP-11 simulator to user-mode only
- Implementing old Unix syscalls
  - reading dirs, ioctls
- Middle-endian data conversions
- Undocumented syscalls ‘features’
  - e.g stat(NULL) == stat(".")
- Extended arithmetic unit in 1st Ed process address space
- Use of stdio caused file I/O problems

Limitations of Apout

- Old Unixes can’t cope with long filenames
- Signal handling not fully implemented
- No support for PDP-11 floating doubles yet
- Not all ioctls implemented yet
- Uses C runtime differences to guess which OS
  - needs small db of a.out signatures
- No support for 3rd or 4th Edition binaries
  - will add this if I ever find any

Apout Uses So Far

- Runs binaries from 5th, 6th, 7th Edition Unix
- Runs binaries from 2.9BSD and 2.11BSD
- Runs binaries from 1st & 2nd Edition Unix
  - even though the underlying OS has been lost
- Earliest C compiler source code (1972 to 1973)
  - can compile these & then self-compile.
- Remember: source is useless unless you can compile and run it 8-)

Apout in Action

The Future of Ancient Unix

- SCO currently has the rights to Ancient Unix
- This is being/has been sold to Caldera
- We are pushing for a more relaxed license
  - e.g BSD
- At the very least, to get rid of on-line license
- 2.11BSD is still being developed
  - has most of 4.4BSD
- 4.3BSD is still being developed
  - to run on more Vaxen
- Still quite a large number of old hardware owners who need this software

Soapbox

- There is no single Open Source license to suit all authors, all developers, all users
- We need a diversity of Open Source OS: Linux, BSDs
  - foster development of new ideas, prevent stagnation
- History of Unix and Open Source is important
  - want to avoid making the same mistakes again
- Favourite tools: rsync, OpenSSH, tcsh, VNC