### Porting OpenBSD

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### Outline

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- What It Takes
- Preparation
- Cross-Development
- The Boot Loader
- Building The Kernel
- Adapting Startup Code
- Writing Device Drivers
- Going Native
- Subsequent Work
- OpenBSD/zaurus
  - History
  - What It Took
  - What Was Done
  - Tricky Parts
  - Current Status
  - Future Plans



#### motivation, some experience, time and persistence

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a user community
"full" support includes that:

release install media is known to work
architecture can compile itself
most of the basic tools exist on the architecture
snapshots are made available on a regular basis
packages exist



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etc/etc.machine/...
distrib/...

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poke around in interesting places and try to remember what you've changed

- opportunity to learn about things
- it's easy to make mistakes and some things can't be tested immediately

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   port
  - as a result, we switch to native builds as soon as possible

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  - easier to port than the BSD kernel: does not use the full build infrastructure
  - harder if you have no BIOS, Open Firmware-compliant or similarly sophisticated firmware to call out to (for console and disk access, device tree traversal, etc.)
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good firmware can be used to simplify things at runtime

like OpenBoot callouts on "sparc" to traverse the device tree or print characters on the console

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#### building bsd.rd is only slightly more complicatd

- install crunch tools from distrib/crunch
- run make in distrib/machine/ramdisk
- rdsetroot may give you problems during cross-development

# Adapting Startup Code

#### begin with start() (locore.S)

- disable interrupts
- bring the processor into a known state
- initialise or disable MMU and caching
- relocate the kernel image
- initialise interrupt controller
- pick up boot arguments
- initialise early console (serial)
- find memory and initialise pmap(9) backend
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use reliable, unbuffered indicators for debugging (LED)

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you can use drivers from other BSDs

 you can mount an NFS root until the disk driver works ("make cross-distrib" can build a minimal distribution) you can mount an NFS root until the disk driver works ("make cross-distrib" can build a minimal distribution)
you have to cheat, but it's done only once:
use the natively-built distribution from another port with the same CPU architecture (cats for zaurus)
worst case: cross-compile the native compiler

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- make the ports tree aware of the new platform, eg create plists

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"cats" and "zaurus" are "multi-arch" ports

- NetBSD/cats ported to OpenBSD by Dale Rahn (drahn@) to support ARM processors
- Dale started in December 2004 based on OpenBSD/cats (but worked on some stuff before, like *lcd(4)*)
- kind-of usable for Theo in January 2005
- first release was 3.7 (released in May 2005)
  - only a few things missing, like audio support
  - work is ongoing



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- money for machines for developers
- an unknown amount of beer :) to start things

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fake apm(4) backend to use the existing framework
and many little things...

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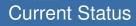
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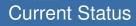
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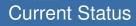
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even Java works

of course, continue to fix and improve stuff

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Fix the ARM pmap issue with write-back caching

#### audio recording

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- what can you think of?



### need donations (time, money, bugfixes, beer) thanks